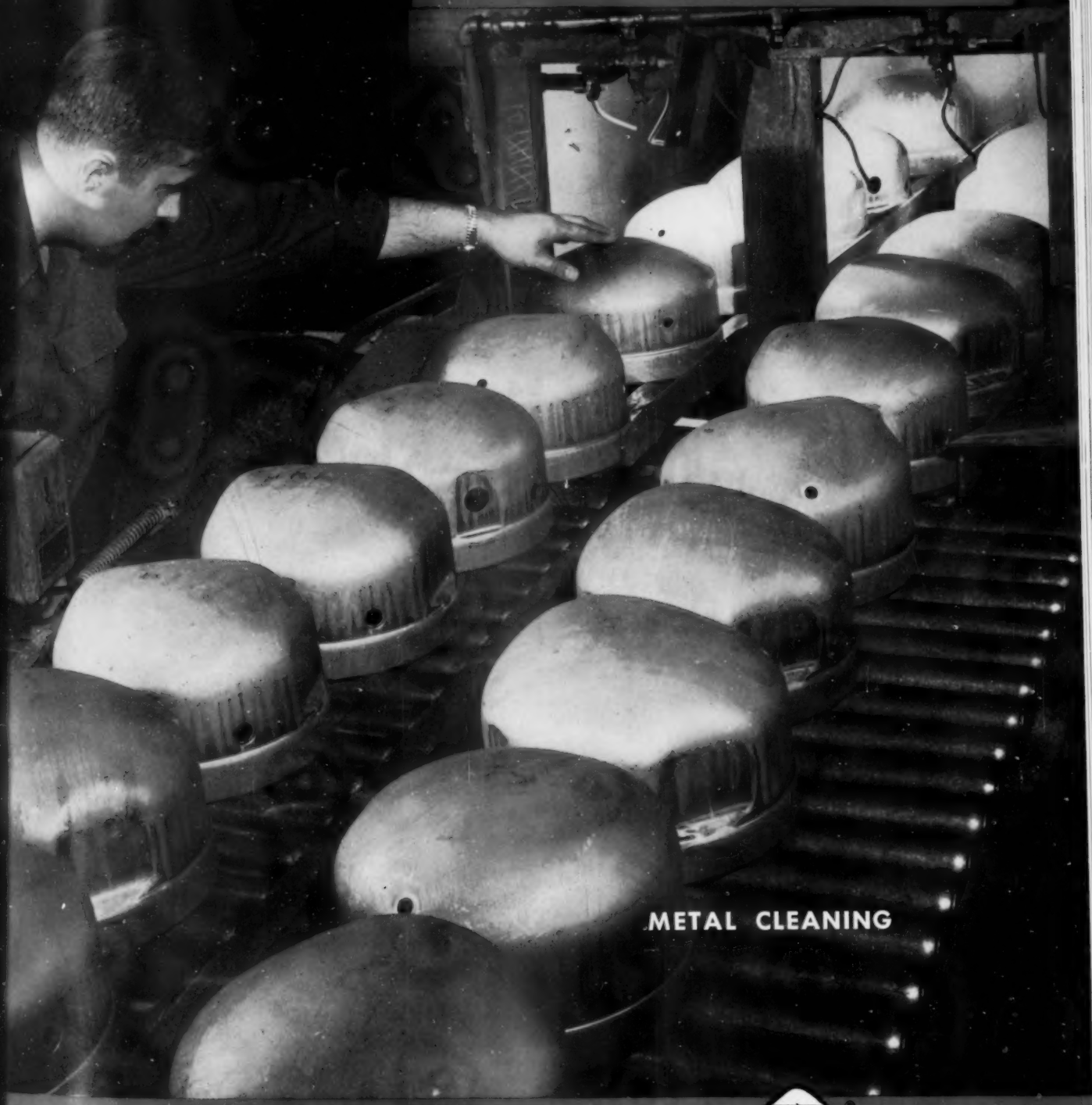
The Tool Engineer

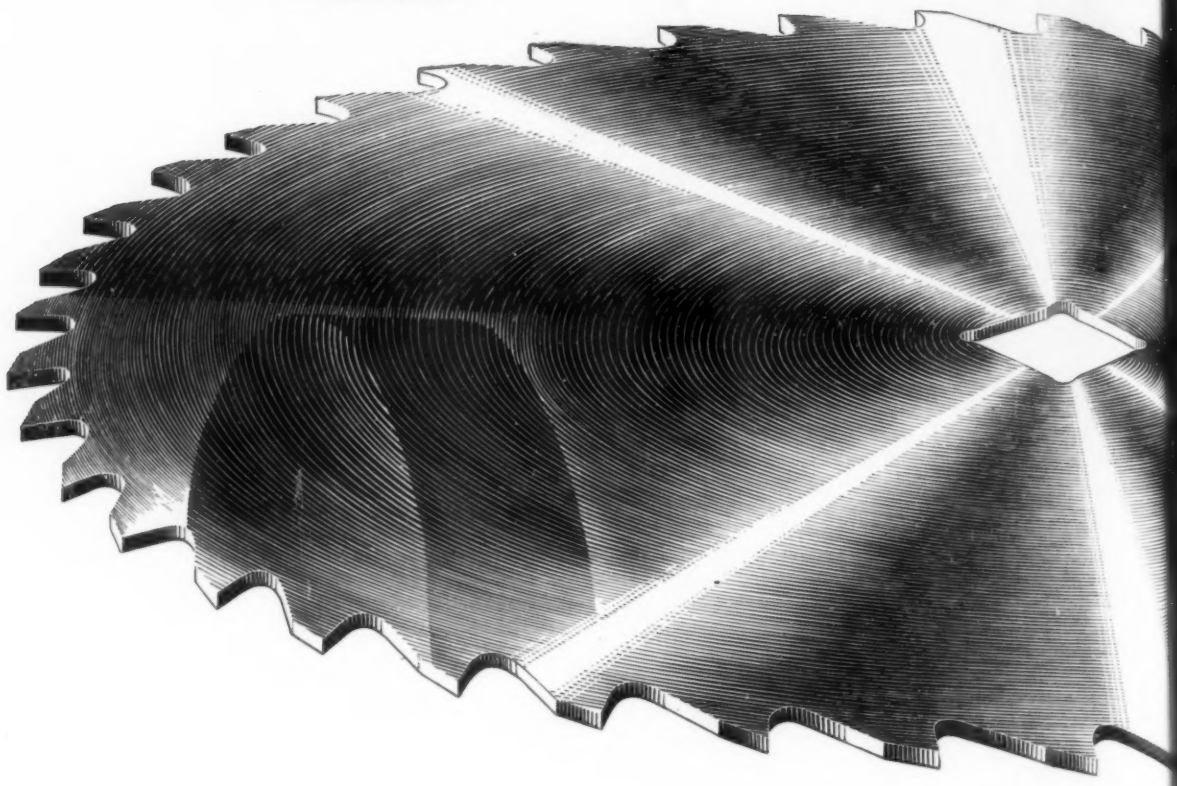


METAL CLEANING

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

NOVEMBER, 1953

PLANNING ENGINEERING CONTROL OF TOOLING EQUIPMENT PRODUCTION



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190% FASTER

Grinding the surface of a circular saw blade isn't a complicated operation, to be sure. But accuracy and precision are mighty important to the success of the end product. And minutes saved per part add up to an important reduction in manufacturing cost.

Here's a case where a Heald Model 261 Rotary Surface Grinder did the job 190% faster than by previous methods. The grinding operation is performed automatically, with maximum speed and precision, at the push of a button. Swiveling of the chuck produces a .005″ taper toward the center of the blade. And loading is simply a matter of placing the blade over a center locating pin in the 12″ magnetic gap chuck, with a drive pin between teeth as an extra safeguard against slippage under heavy cuts.

Remember—when it comes to precision finishing, it pays to come to Heald.

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Surface Grinding Machines
and Bore-Matics

HEALD

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Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • N... York

Cover: Compressor shells for refrigeration units are washed at Nash-Kelvinator Corp., Detroit, prior to painting. Drawing and rustproofing compounds are removed inside and out with an emulsion cleaner sprayed under pressure. Cleaning for metal finishing is discussed in the article beginning on page 69.

The Tool Engineer

Volume XXXI, No. 5 **November, 1953**

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THE TOOL ENGINEER is regularly indexed in *The Industrial Arts Index.*

AMERICAN SOCIETY OF TOOL ENGINEERS

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The Tool Engineer

Whither Next?

Great strides have been made in automating chemical processes, machine operations and mechanical assemblies. Some are marvels of the past and no engineer would give a second thought to applying manual controls to them even for small quantity lots. Others, being more recent, are more spectacular because of their novelty and the fact that they are usually more complex.

There is a tremendous premium, however, upon simplicity and directness of approach in achieving a desired goal. The advantages are obvious but the inventiveness and genius of the tool engineer are taxed in attaining the direct result. The difficulties probably stem from a fixed approach based upon familiarity with prior art and an attempt to improve upon it instead of taking a fresh viewpoint and a new approach. Realizing this, many engineers say they would rather visit a plant in another field than one of a competitor. More ideas would be seen that could be adapted and utilized. In a competitor's plant ideas would be apt to balance out. Some would be costly and better, many would not be as good.

Originally, no doubt, automatic operations were conceived and developed to remove drudgery from factory work. More uniform and consistent products resulted. As these improvements became more refined, quality became an item under direct control. Now, however, engineers view automation as an economic necessity. With its use, costs are controllable whereas those for manual operations are not.

Rising costs, competition and better standards of living have contributed to make the tool engineer indispensable. In the past he has always had the answer to production problems. Now, by extending automation to more and more operations while refining and simplifying its application, he will have the answer for the future.

John W Greve

EDITOR

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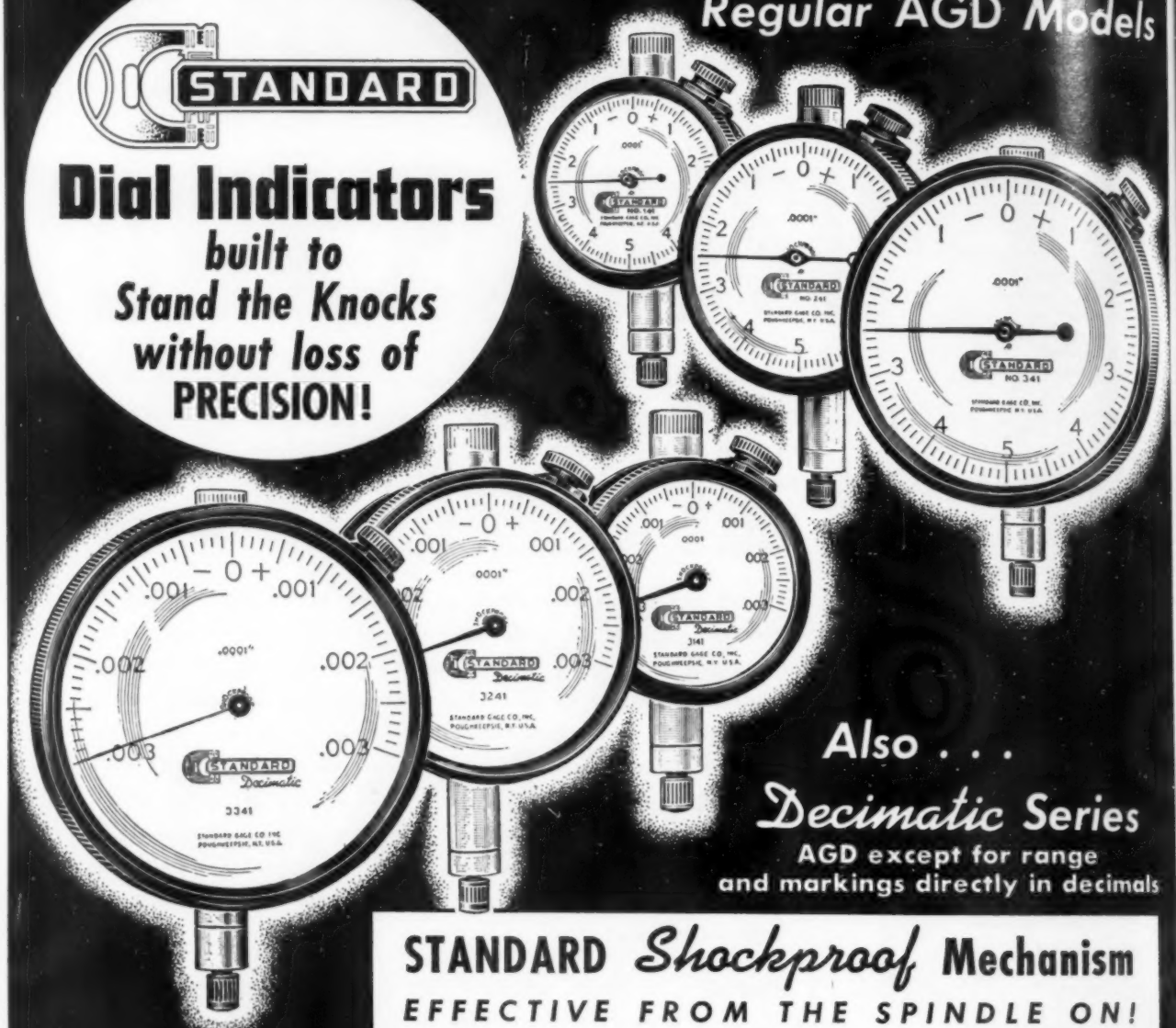

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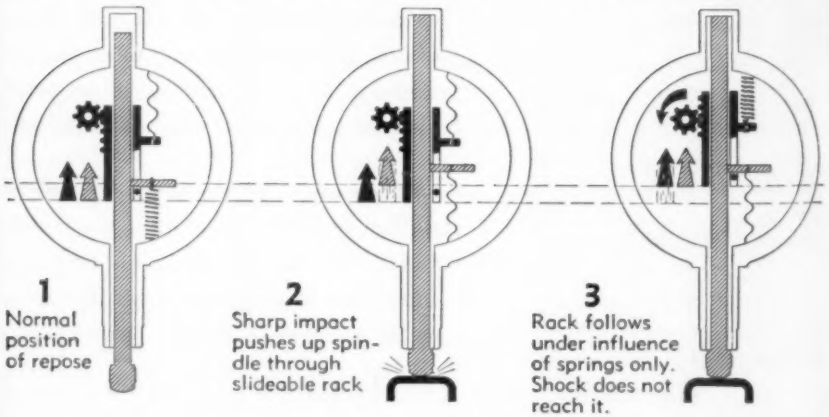

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Actual Size

Collet "B"
Actual Size

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Collet "B"

CAPACITY: 7/8" Round, 3/4" Hexagon, 5/8" Square
USED ON: 12" and 14" American; 14" Cincinnati; 12", 14" and 16" Hendey; 12", 14", 16" and 18" Monarch; 9", 15" and 16" Rockford; 12", 14" and 16" Sebastian; 14" and 16" Springfield Lathes.

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Answer: Collet "A" is a 5C Hardinge. Collet "B" is a 3H Hardinge.

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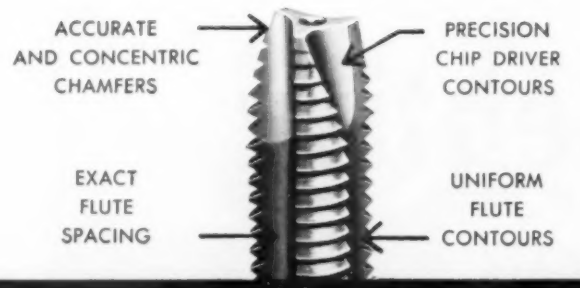

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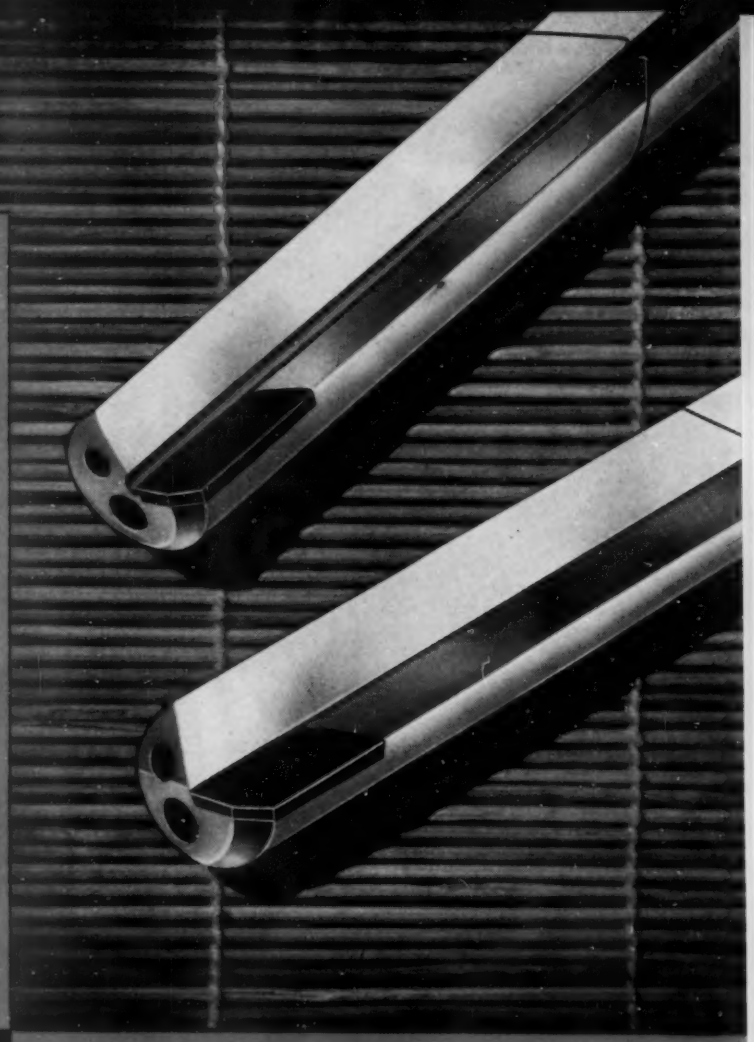

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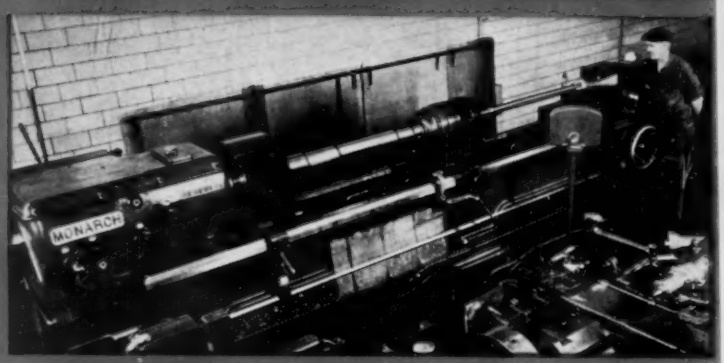

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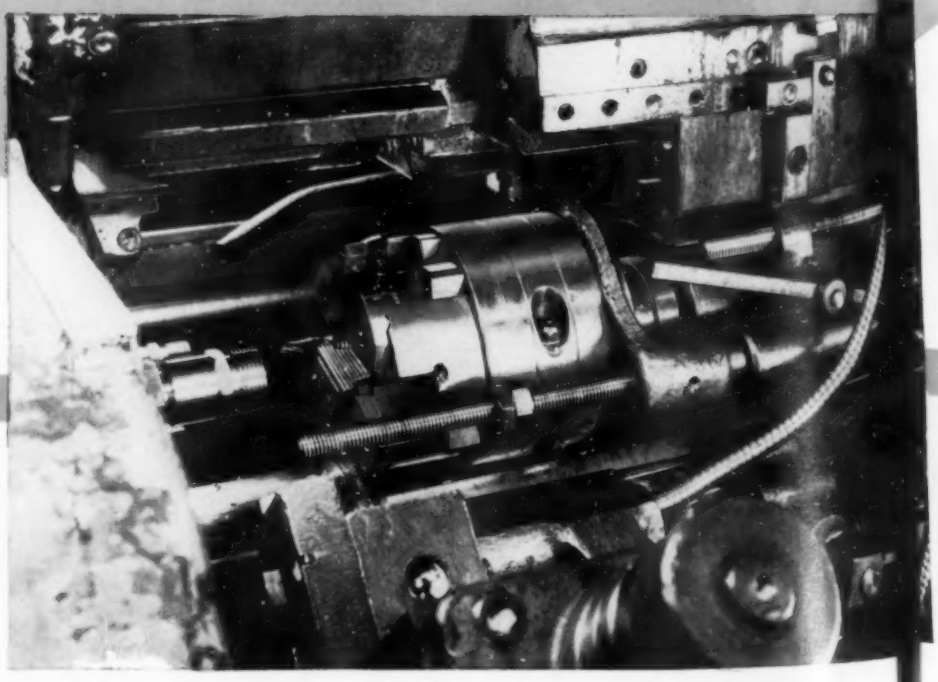

WORLD'S

The

A 1¼" JX LANDEX Head on a 1¾" Warner & Swasey Automatic is shown threading ¾" Press-Lock spuds. 1" Straight Pipe threads are cut on B-1113 steel, with an average of 3000 pieces threaded between chaser grinds. These spuds are one of the many types of industrial hose couplings and valves produced by the Dixon Valve and Coupling Company of Philadelphia.

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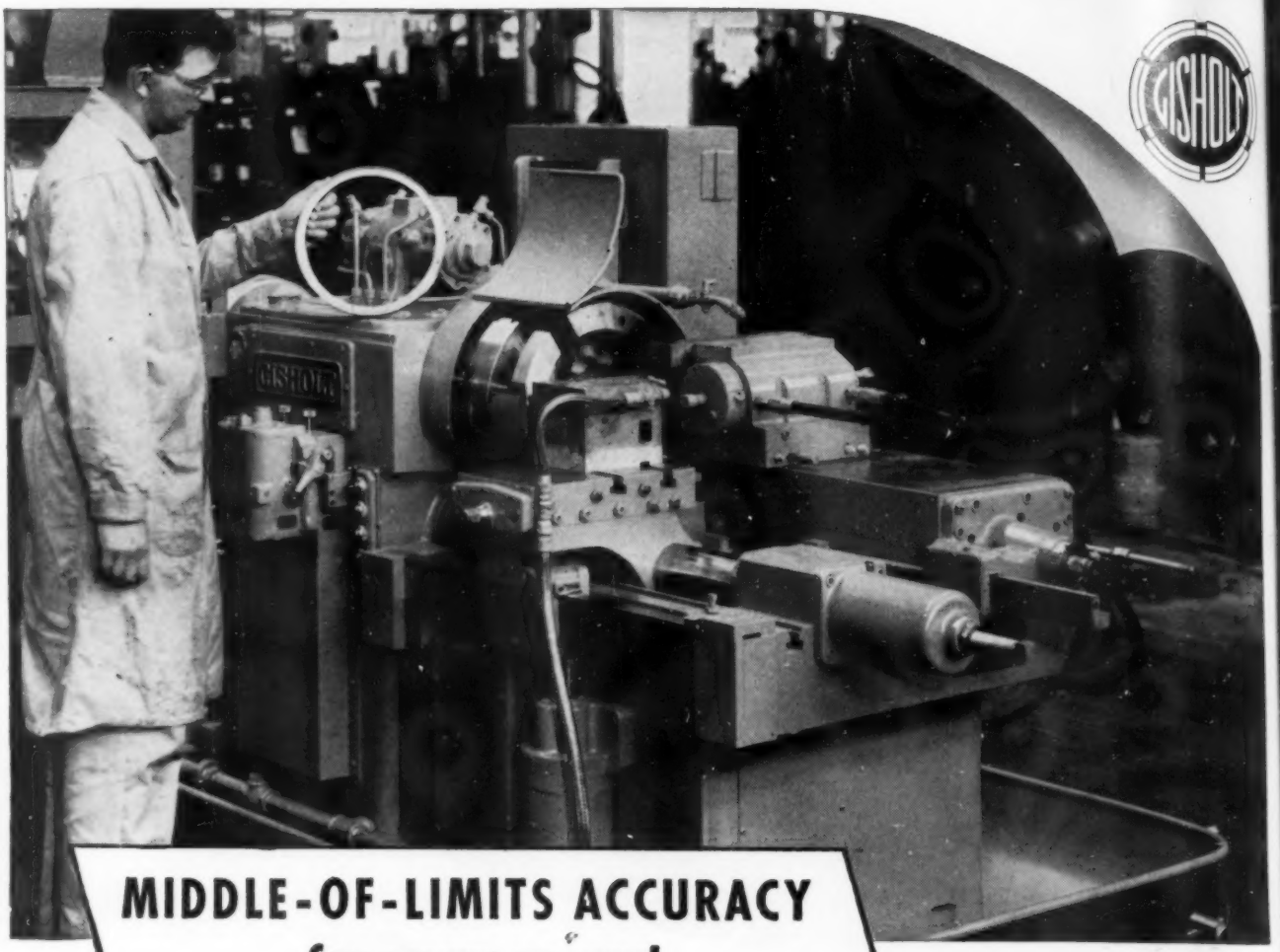

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for years on end

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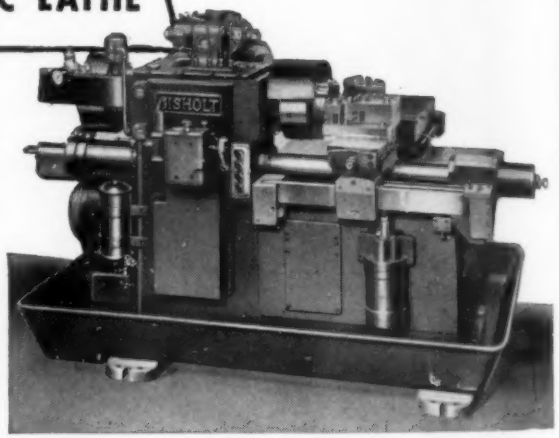

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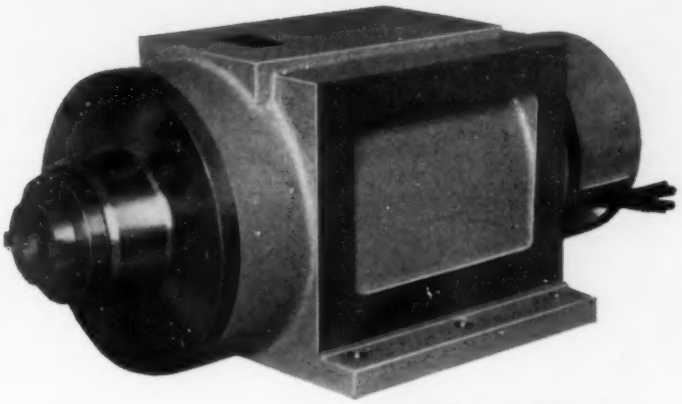

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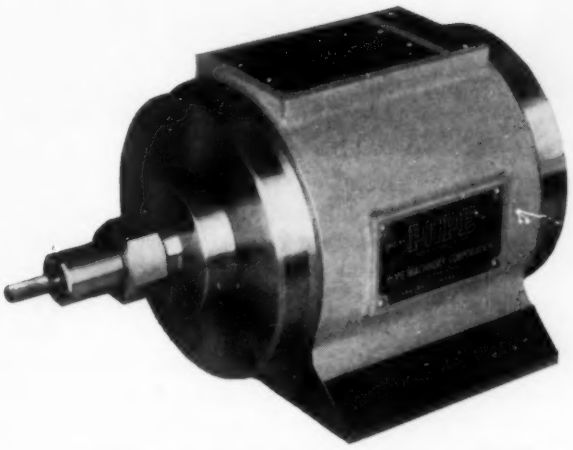

2 pole — 4 pole motor ¾ h.p. at 12000 r.p.m.
½ h.p. at 6000 r.p.m. 1 h.p. at 18000 r.p.m.
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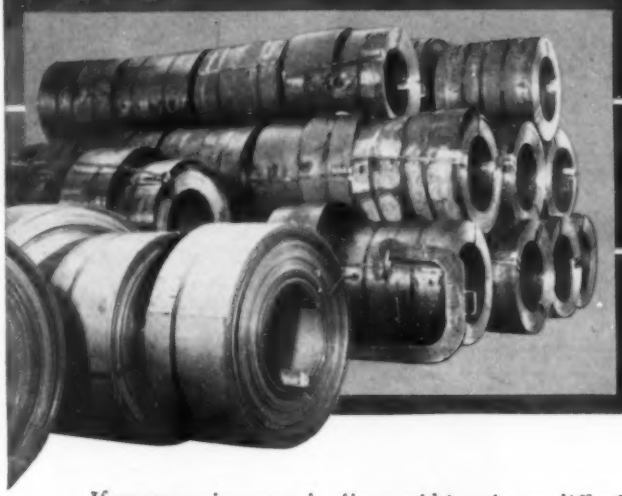

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with a quarter

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- remove all the required metal on a TURBINE DISC; go through the automatic cycling — repeatedly;
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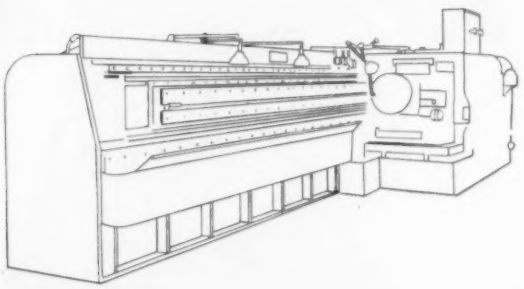

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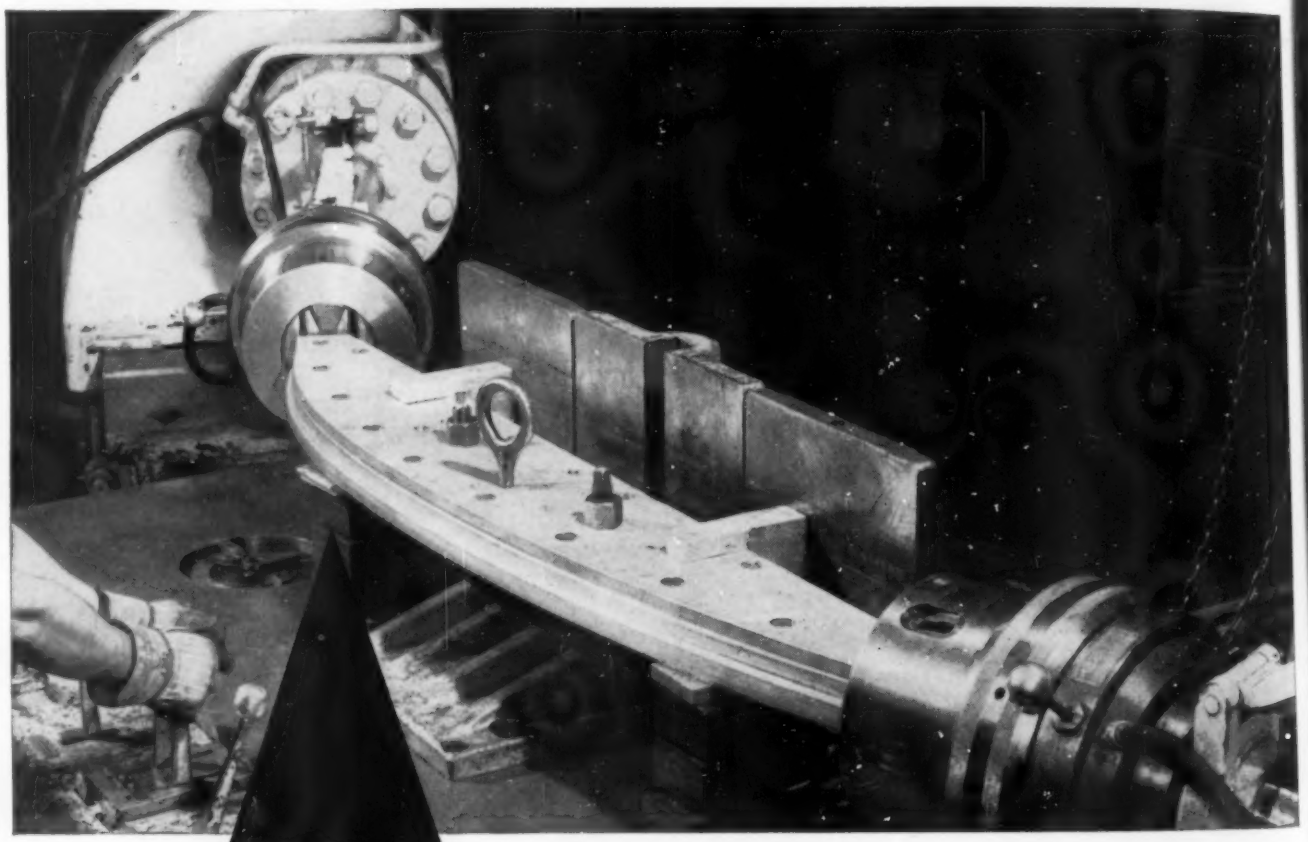

This Stretch Forming Die is Aluminum

Alcoa Aluminum

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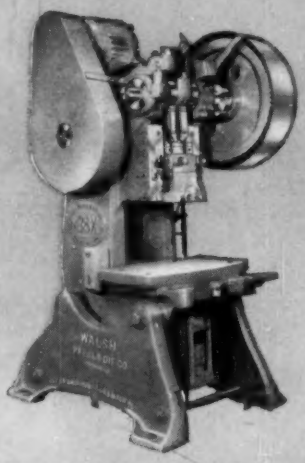

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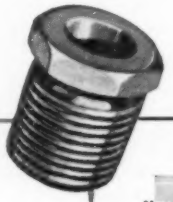
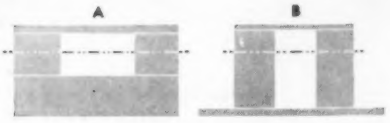
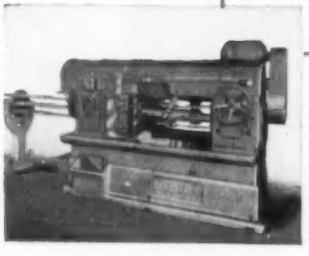


MATERIAL—EVERDURE: (96% copper, 3% silicon, 1% manganese) Hole drilled with 17/32" drill to 1½" depth; thread rolling of ½" pipe thread.

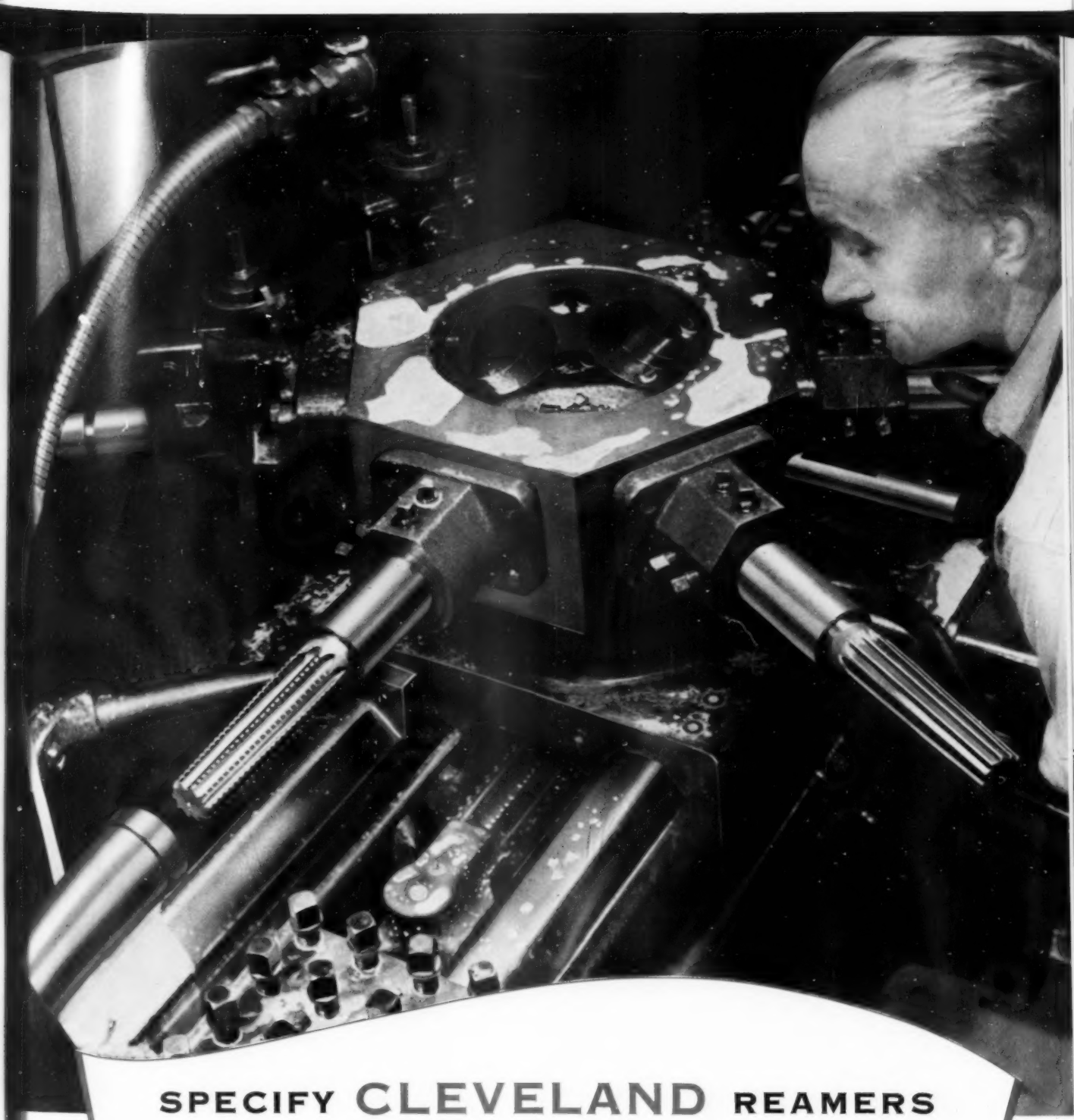
	HSS	CARBIDE
Cycle Time	35 secs.	15 secs.
Work Spindle Speed	420 R.P.M. at 124 S.F.	850 R.P.M. at 250 S.F.
Tool Wear	2000 pcs. per grind	5000 pcs. per grind



The CONOMATIC is the ONLY representative of Frame "A". The short, "weave-proof," upright members, secured between larger and heavier top bed and base, make possible the strongest type of bridged support to the tooling area and its "work and tool axis."



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



SPECIFY CLEVELAND REAMERS

For Smooth Finish and Economy

A *complete* line of Reamers, offering a wide range of types and sizes for every requirement. All are correctly engineered to give you accuracy, efficiency, long life and *more holes per grind.*

THE CLEVELAND TWIST DRILL CO.

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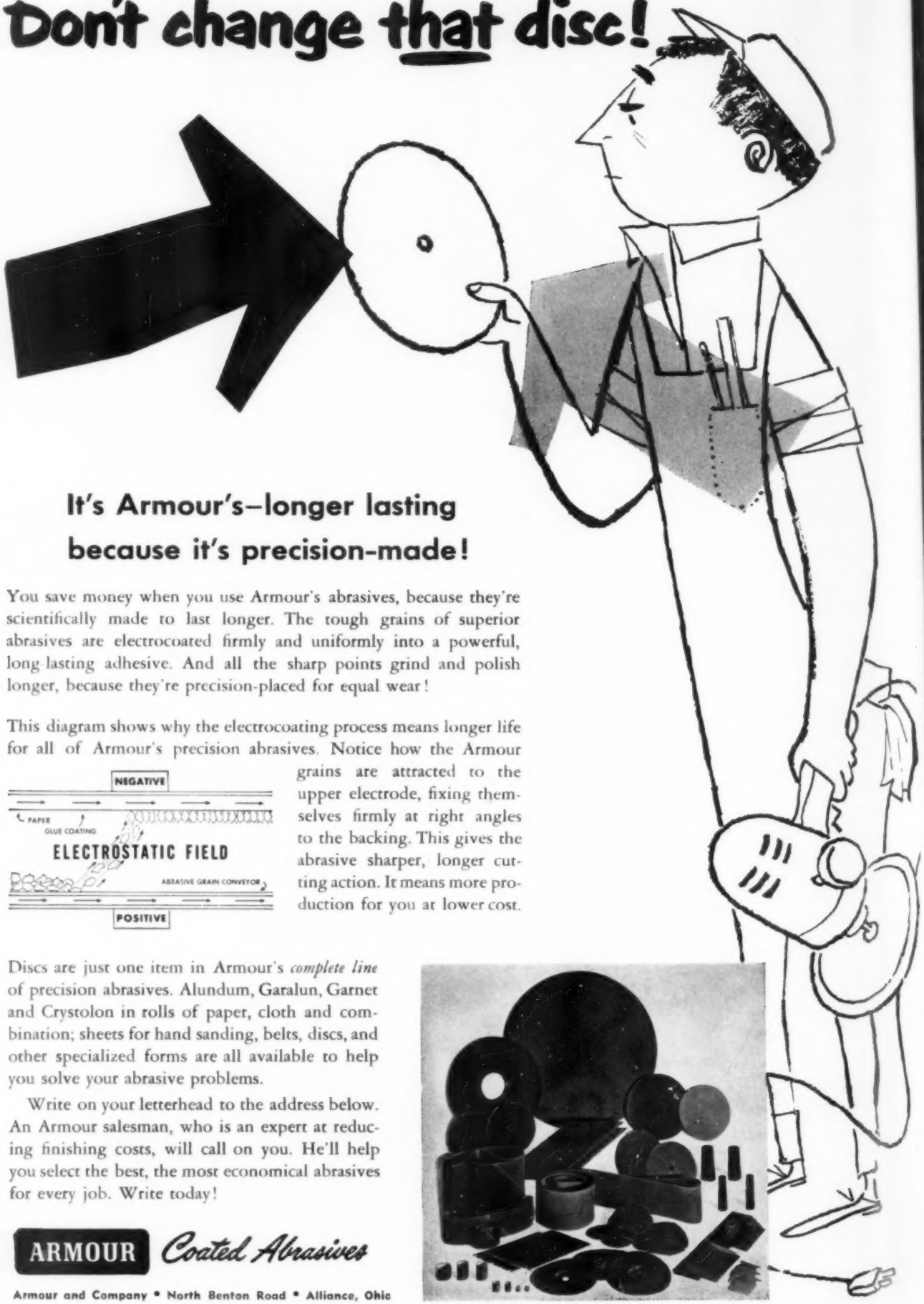
E. P. Barrus, Ltd., London W. 3, England

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

Don't change that disc!



It's Armour's—longer lasting because it's precision-made!

You save money when you use Armour's abrasives, because they're scientifically made to last longer. The tough grains of superior abrasives are electrocoated firmly and uniformly into a powerful, long lasting adhesive. And all the sharp points grind and polish longer, because they're precision-placed for equal wear!

This diagram shows why the electrocoating process means longer life for all of Armour's precision abrasives. Notice how the Armour grains are attracted to the upper electrode, fixing themselves firmly at right angles to the backing. This gives the abrasive sharper, longer cutting action. It means more production for you at lower cost.

Discs are just one item in Armour's *complete line* of precision abrasives. Alundum, Garalun, Garnet and Crystolon in rolls of paper, cloth and combination; sheets for hand sanding, belts, discs, and other specialized forms are all available to help you solve your abrasive problems.

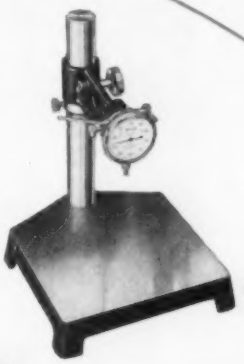
Write on your letterhead to the address below. An Armour salesman, who is an expert at reducing finishing costs, will call on you. He'll help you select the best, the most economical abrasives for every job. Write today!

ARMOUR *Coated Abrasives*

Armour and Company • North Benton Road • Alliance, Ohio

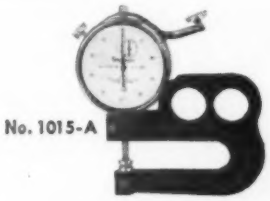
MADE TO STARRETT STANDARDS OF ACCURACY AND PERFORMANCE

STARRETT DIAL GAGES
Made in a complete range of standard A.G.D. sizes and 54 types, with English or Metric graduations.



STARRETT DIAL COMPARATOR No. 653
With fine vertical adjustment. Base platen 9" x 9⅝". Vertical capacity 9¼". Throat depth 5". Indicator graduated .001".

Starrett DIAL INDICATORS



STARRETT PORTABLE DIAL HAND GAGES No. 1015-A and 1015-B
½" and 1" thickness capacities; 2½" throat. Ideal for quickly measuring plywood, rubber, textiles, paper, metal parts, leather, veneer, fabrics, etc.

STARRETT UNIVERAL DIAL BENCH GAGE No. 652
With sliding table and fine adjustment. Capacity 1¾", throat depth 1⅝". Indicator graduated .0005".

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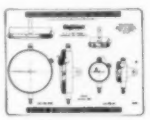
DIAL INDICATOR CATALOG describes and illustrates the complete line with specifications and useful data . . . Address Department E.



TRANSFER and DIMENSION CHARTS. Full scale details for quick tracing plus complete dimensions of all indicators and contact points.

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TRADE MARK Starrett REG. U. S. PAT. OFF.

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WORLD'S GREATEST TOOLMAKERS

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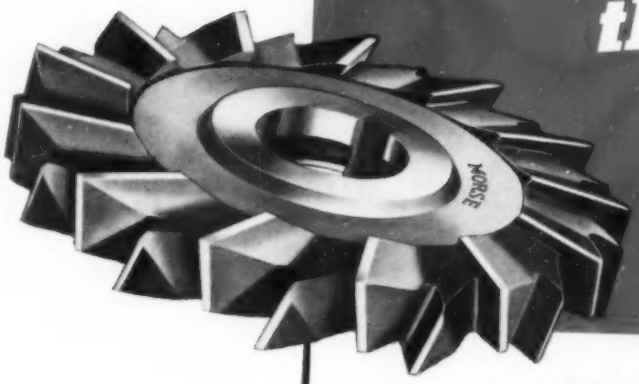
Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
Prompt delivery
Dependable service
Quality products

He never cares how black his white collar gets—when there's a job to be done for you!



...Your Morse-

ASK

Franchised Distributor

He's an everyday working man, your Morse-Franchised Distributor. He pitches in with your own men, right up to the elbows, when there's a cutting tool problem to be licked. Remember he has the hard-earned experience to do it . . . backed by the tool industry's finest engineering staff and the confidence that comes of his knowledge that back of him is a *complete line of the world's finest cutting tools.*

So when you are faced with a tough problem involving cutting tools, send for your Morse-Franchised Distributor. He'll take it off your hands, and clean it up fast and right! *Call him today.*

MORSE TWIST DRILL & MACHINE COMPANY, NEW BEDFORD, MASSACHUSETTS

(Division of VAN NORMAN CO.) • Warehouses in New York, Chicago, Detroit, Houston, San Francisco

MORSE

Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

ASK BAIRD ABOUT IT!

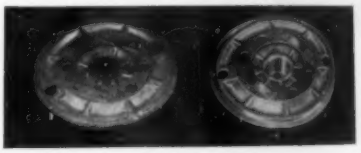
HIGH PRODUCTION TOOLING

TOOLS MOVE HORIZONTALLY, OTHERS VERTICALLY, FOR FACING . . . TURNING

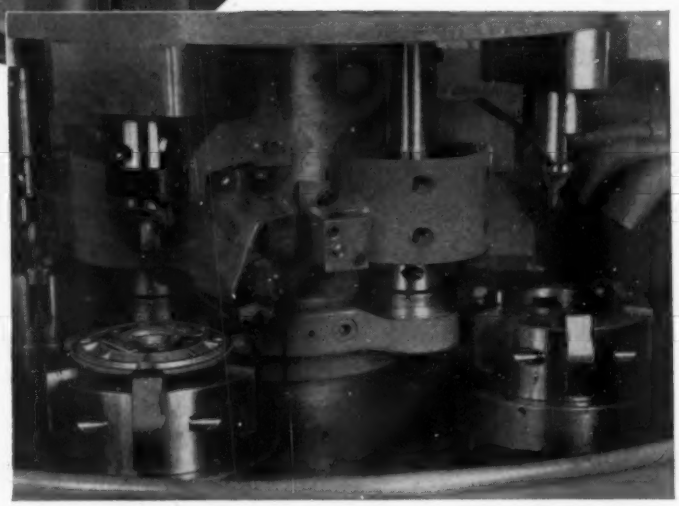
. . . and that's but one of the excellent features of Baird's No. 54VC (5" chuck, 4-spindle, vertical continuous lathe). As the turret revolves, eliminating unproductive indexing time, holding fixtures grip and release automatically for easy loading and unloading. Tools feed in and out of the cutting stroke.

This typical Baird tooling set-up bores the hole, faces and chamfers the hub, and turns the flange of a generator end plate. Cycle time 19.48 seconds, 5 seconds per piece, 720 per hour. Feed: boring hole and facing hub .0039" . . . turning flange .005" and .002" (forming tools). Cutting speeds: boring 348 ft.; turning 1985 ft. per minute.

Safety for operator and prevention of machine and product damage are mechanically and electrically controlled; tools cannot feed to work unless spindles are revolving; electrical equipment is enclosed, wiring concealed.



BEFORE AND AFTER



(Above) Front view, showing splash guards for wet cutting.

(Right) Tooling set-up for finishing a generator end plate.

FEATURES BAIRD 4-SPINDLE VERTICAL LATHE

1. Compact design.
2. Easy to tool and operate.
3. Simple . . . dependable.
4. Extremely accurate.
5. Unusually versatile.
6. Outstanding production records.

Installation of Baird automatic machines is a step in the right direction against tough competition. "Ask Baird about it!"

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

78A53

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-22

why WALES HOLE PUNCHING & NOTCHING EQUIPMENT *Can't be beat!*

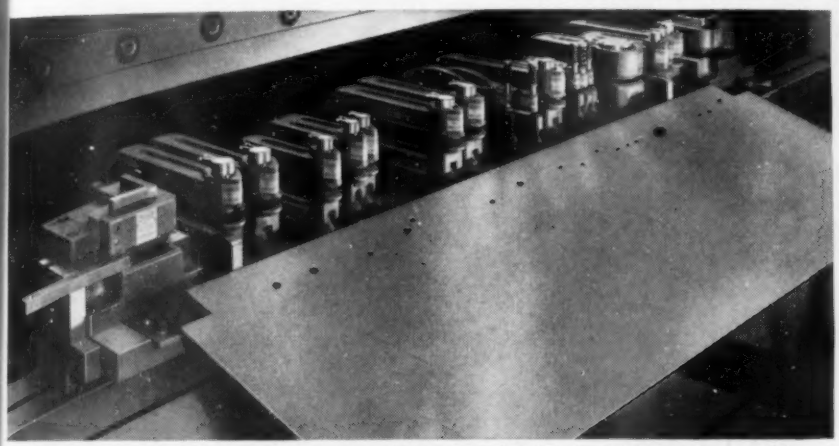
Independent, self-contained Wales Hole Punching and Notching Units *reduce setup time from hours to minutes.*

Check these Wales time saving, money saving advantages:

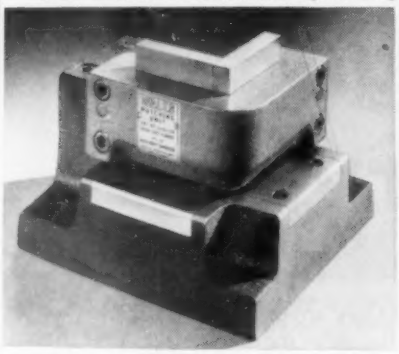
- Nothing attached to press ram
- Interchangeable punches and dies
- Punches and dies always in perfect alignment
- No die set required
- Press "down time" practically eliminated
- Used and reused in unlimited setups
- Makes setup a simple, quick assembly operation

Wales Hole Punching and Notching Units "can't be beat."

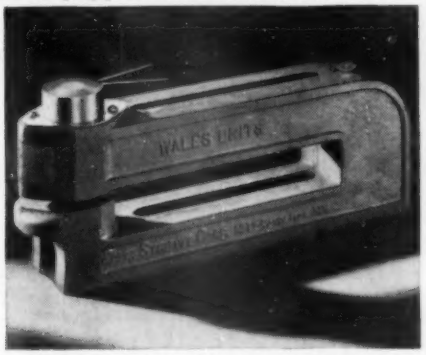
IT'S TOO BIG A STORY TO TELL ON THIS PAGE SO . . .



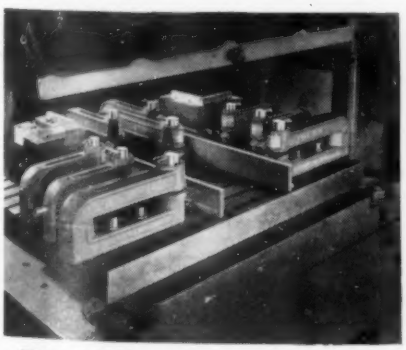
Showing a staggered hole punching setup of Wales Type "BL" Units with Wales Type "NA" Notching Units at each end for hole punching and notching in the same operation on a press brake. These same Wales Units may be set up in a stamping press as shown at bottom.



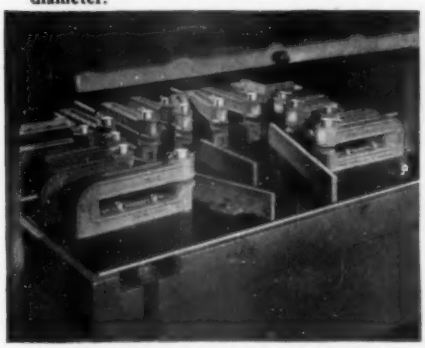
Wales Type "NA" Notching Unit for notching 90° corners.



Wales Type "BL" Hole Punching Units for punching round and shaped holes up to 2" in diameter.



Wales Hole Punching and Notching Units set up on "T" Slotted Plate in a stamping press.



Showing Wales Hole Punching and Notching Units set up on a template in a stamping press.

Write for COMPLETE, FULLY-ILLUSTRATED, FUNCTIONALLY COLORED CATALOGS BL and N **NOW**

WALES-STRIPPIT CORPORATION

George F. Wales, Chairman

393 **Payne Avenue, North Tonawanda, N. Y.**

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

Norton announces...

Your product parts will perform better — and gain in value — when the product-improving "Touch of Gold" is added in Norton's new Job Lapping Department

A new, enlarged job lapping service

Now you can improve your product quality with precision lapped parts!

The new Norton Job Lapping Service is ready to help you improve product quality and performance — by furnishing parts to your exact specifications.

Complete and modern in every detail, the new department is manned by expert personnel, operating Norton machines for every type of lapping. Results are checked on the latest electrical and optical inspection equipment, while precision accuracy is further assured by careful atmosphere control. The scope of jobs that can be handled is broad, covering:

Materials — Practically unlimited in range, including hardened steel, stainless steels, stellite facings, cast iron, nonferrous pressed and die-cast parts.

Types of Lapping — Single and parallel face flat lapping, to specifications ranging from stock removal to optical flatness. Also, external cylindrical lapping to high precision requirements.

Workpiece Capacities — Flat work up to 24″ across. Cylindrical work from 1/16″ diameter by 1/2″ long to 2″ diameter by 8″ long.

Meeting Your Needs Exactly — The entire project is under direct supervision of Norton Lapping Engineers, pioneers in the development of mechanical lapping processes and machines. They are prepared to work out the best lapping techniques for your requirements. For full details, see your Norton Representative or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit • *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5

Our ...th Year
Combine WESSON TOOL ENGINEERING SKILL AND EXPER...

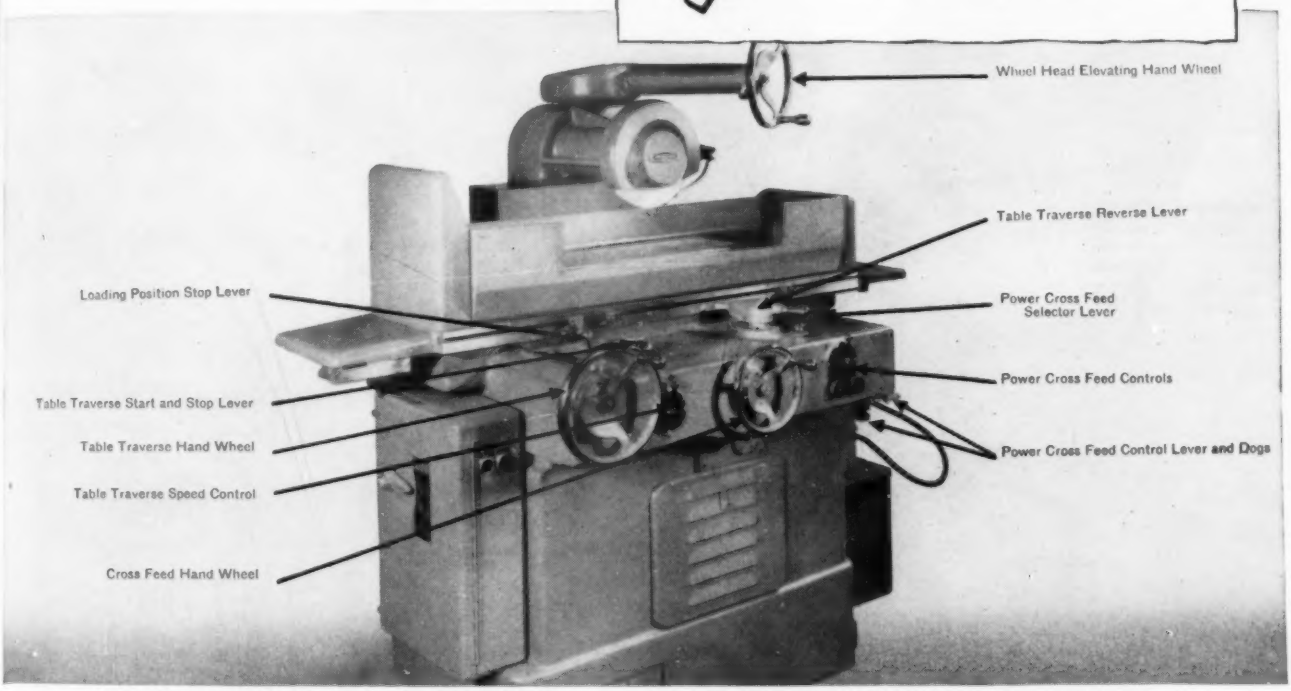
Easy to set up...
Easy to operate...

This 8" Norton Surface Grinder gives you the

"TOUCH OF GOLD"

on all kinds of jobs!

☑ production or tool room
☑ military or civilian


Wheel Head Elevating Hand Wheel
Table Traverse Reverse Lever
Loading Position Stop Lever
Power Cross Feed Selector Lever
Power Cross Feed Controls
Table Traverse Start and Stop Lever
Table Traverse Hand Wheel
Power Cross Feed Control Lever and Dogs
Table Traverse Speed Control
Cross Feed Hand Wheel

NOTE SIMPLICITY AND CONVENIENT GROUPING of controls on the Norton 8" x 24" surface grinder. Quick set up cuts your unit costs . . . makes "breaking in" of new production help far easier. It gives you the "Touch of Gold"

Here's a rugged machine with the real value-adding "Touch of Gold". It sets up quickly for a production run and maintains accuracy on quantity parts. But it's also efficient for grinding a variety of small units in tool room work. Its quick set up saves you time from job to job!

On a Norton Grinding Machine every touch of the wheel on the work is a "Touch of Gold" that gives you more value and profits. Investigate this great new grinder and its companion machines, the Norton 6" and 10" hydraulic surface grinders.

Remember — only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost. And Norton also offers you the world's most complete line of grinding machines.

We'll be glad to discuss your present problems or your plans for "post emergency" production, fitting tentative delivery schedules into your future plans.

Write for 12-Page Catalog 190 describing the Norton 8" x 24" surface grinder. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With NEW

NORTON

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Making better products to make other products better

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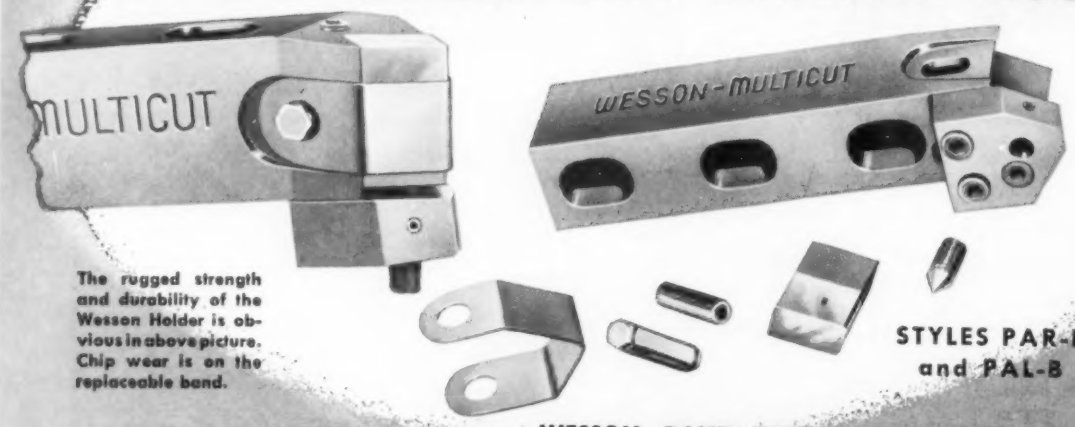
WESSON METAL HIGH PERFORMANCE for Increased Production . . .

Combine WESSON TOOL ENGINEERING SKILL and EXPER

Our 30th Year In Carbide!

This New WESSON Engineer TOOL HOLDER

ROUGH TURNS HOT FORGED 155 MM SHEL



The rugged strength and durability of the Wesson Holder is obvious in above picture. Chip wear is on the replaceable band.

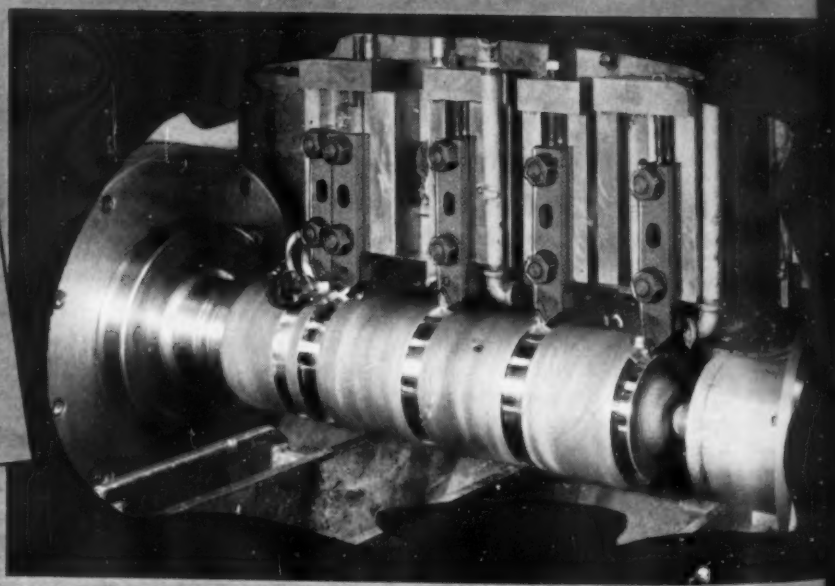
STYLES PAR-B and PAL-B

WESSON MULTICUT PARALLELOG BAND TYPE HOLDER

WESSON BAND TYPE HOLDERS ARE VIRTUALLY INDESTRUCTIBLE E UNDER ABNORMAL CONDITIONS. THE STEEL BAND IS REPLACEABLE AT Y LOW COST. 101 DIFFERENT STANDARD STYLES AND SIZES ARE AVAILA

ACTUAL JOB SETUP NOW AT A LARGE SHELL MANUFACTURING CO.

Part.....155 MM hot forged shell.
Operation.....Rough turning.
Machine..Burleigh Stocker Hydra-Feed automatic lathe.
Tools.....5 Wesson Multicut Band Type Parallelogram Tool Holders with Parallelogram Wesson-metal insert grade WM.
Depth of cut.....Up to 1" maximum.
Feed.....032 per revolution.
S.F.M.....320.



The Wesson Tool Engineer in your area has full details on this job. Ask him about Case History #135.

This photo, taken while the machine was running shows the depth of cut and type of finish obtained by rough turning with Wesson Holders and Wesson-metal insert. Note extra holder strength possible with the parallelogram insert. The lead angle is 25°.

WESSON COMPANY

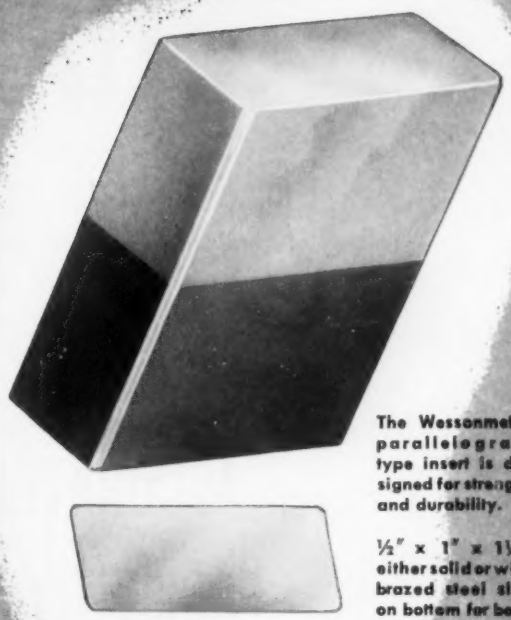
1220 WOODWARD HEIGHTS BLVD. FERNDALE (DETROIT 20), MICH.

WESSONMETAL HIGH PERFORMANCE *for Increased Production . . .*

. . . And *This*

WESSONMETAL INSERT

TH CUTS UP TO 1" DEEP!



The Wessonmetal parallelogram type insert is designed for strength and durability.

½" x 1" x 1½" either solid or with brazed steel slug on bottom for back up screw contact.

nother FIRST for WESSON

with Tool Costs Reduced by Over 60%
Production Increased 400%

OLD METHOD	NEW WESSON METHOD
l Cost.....$37.50	Tool Cost.....$50.00
able Carbide.....⅜"	Useable Carbide.....⅝"
erage Pieces per Grind...60	Average Pieces per Grind...60
es Machined per Tool..420	Pieces Machined per Tool..1680
l Cost per Piece.....8.1c	Tool Cost per Piece.....2.9c
wn Time for Tool Change... 15 min. every hour	Down Time for Tool Change... 4 min. every hour

WESSONMETAL IS OUTSTANDING FOR HIGH PERFORMANCE BECAUSE IT IS UNIFORMLY DEPENDABLE IN QUALITY

WESSONMETAL is available in 8 grades for all types of metal working.

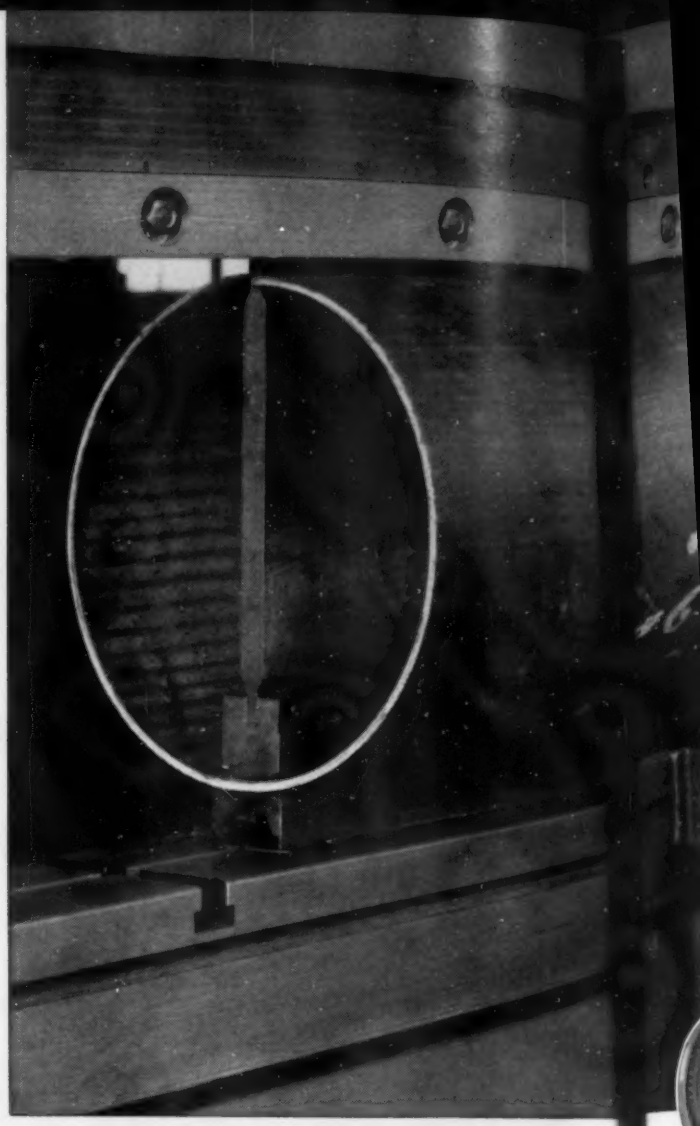
SEE THE DRAMATIC STORY OF CARBIDE in Sound and Color
"THIS CARBIDE AGE"
There's a Wesson Tool Engineer in your area who will give you full details about this fine educational movie. Call him or write.

WESSON METAL CORPORATION

LEXINGTON 34, KENTUCKY

pipes ...tubes ...posts

...ACCURATELY and EASILY formed on



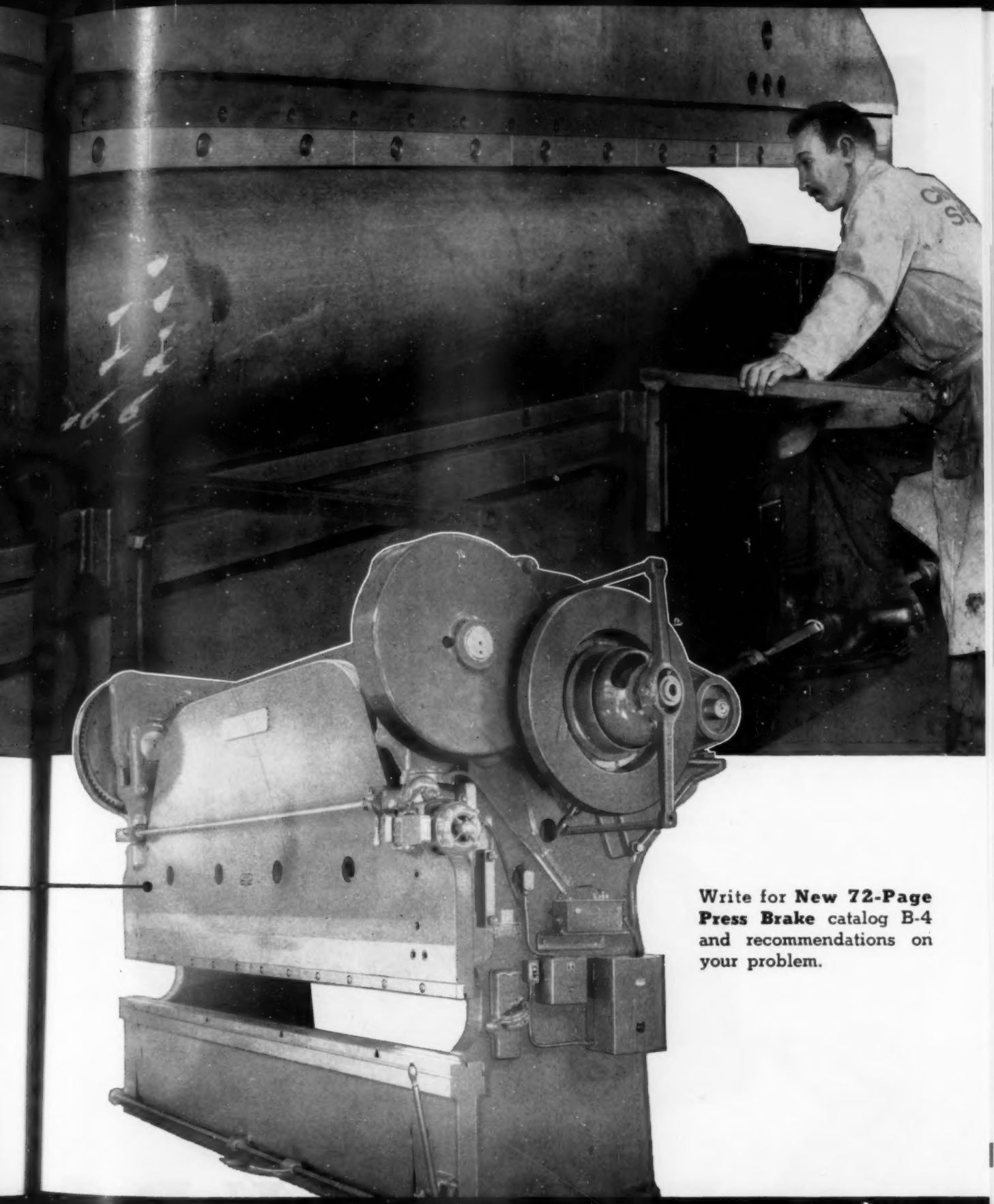
Cincinnati Press Brakes

Large diameter pipes and tubes can be completely formed on versatile Cincinnati Press Brakes. Round, tapered lamp posts up to 30 feet long are also formed by prekinking the edges and then completing the tapered tube in several additional hits on taper dies.

Cincinnati Press Brakes also crimp sheet and plate before rolling to eliminate flats at the seam edges.

• Holding fixtures are d

LEXINGTON 34, KENTUCKY



Write for **New 72-Page Press Brake** catalog B-4 and recommendations on your problem.

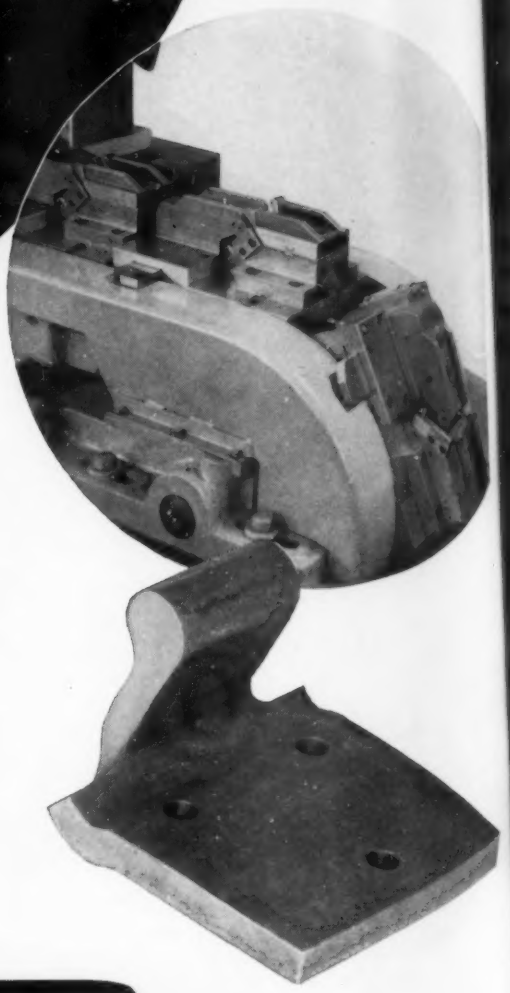
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

lower cost per piece . . .

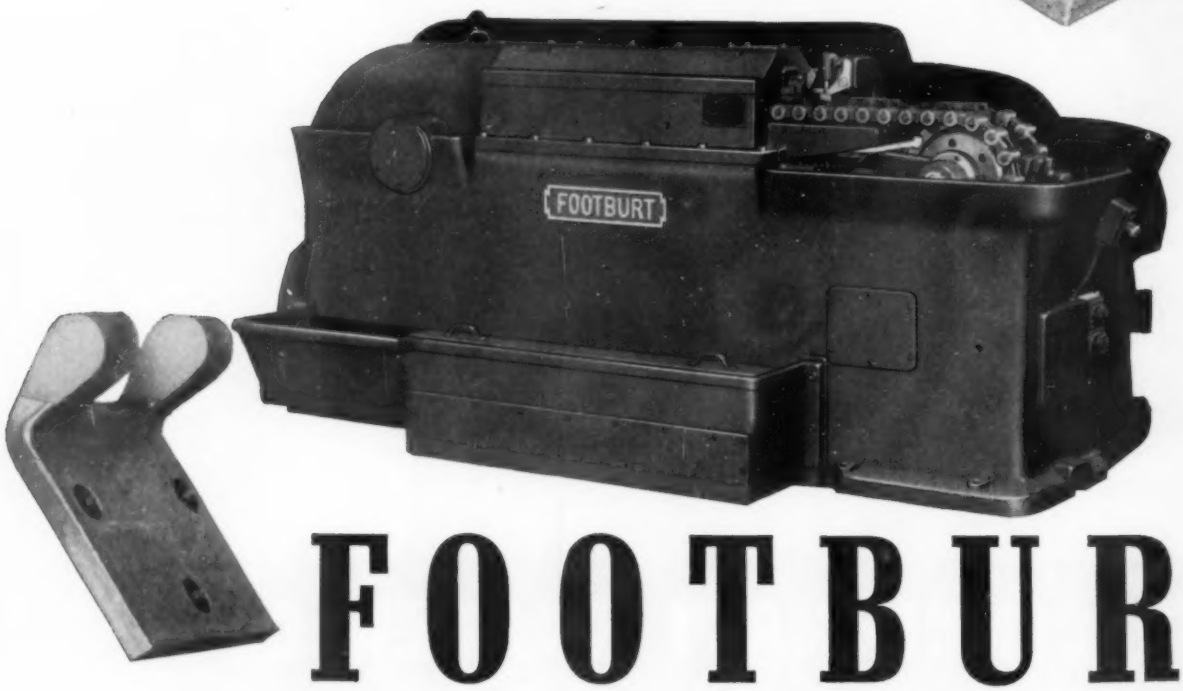
with continuous surface broaching of small parts



• Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

• In many plants where large quantities of duplicate metal parts are being machined substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching in many fields.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building



FOOTBURT

PRODUCTION MACHINE TOOLS

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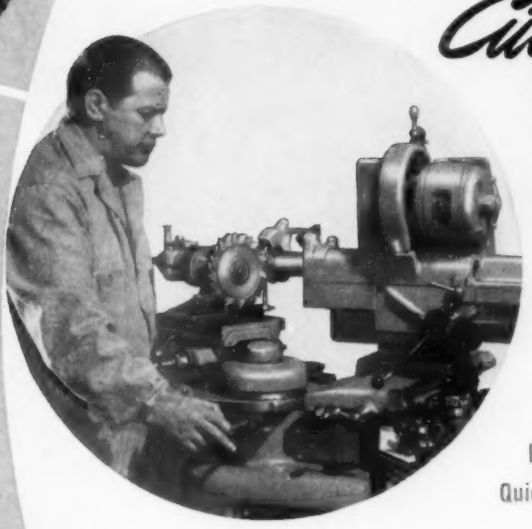
You, too, can

"WHITTLE DOWN"

GIVE YOUR CUTTING TOOLS THE EDGE

WITH A

PRATT & WHITNEY *Cutter and Radius* GRINDER

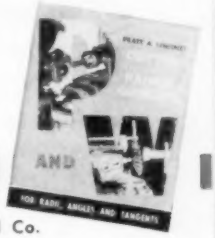


RADII, ANGLES or TANGENTS... STRAIGHT or TAPERED FLUTES... SQUARE, RADIUS or BALL ENDS—Grind Them Quickly, Economically, Accurately

Today's high speed machines require sharp, accurately ground cutting tools for efficient production. A Pratt & Whitney Cutter and Radius Grinder will give you longer tool life, faster stock removal and lower tooling costs.

Practically every type of cutting tool — stock or special — can be ground quickly and economically. Difficult jobs like grinding accurate ball and radius noses on end mills are handled with speed and ease. To assure flute uniformity and concentricity, all tools are ground from the shank — and not from centers.

The P&W Cutter and Radius Grinder is expertly designed for ease of operation and is ruggedly constructed of the finest materials for a long, accurate life under hard, constant use. Two sizes grind flute lengths up to 4½" and 10" respectively. Mail coupon for complete information.



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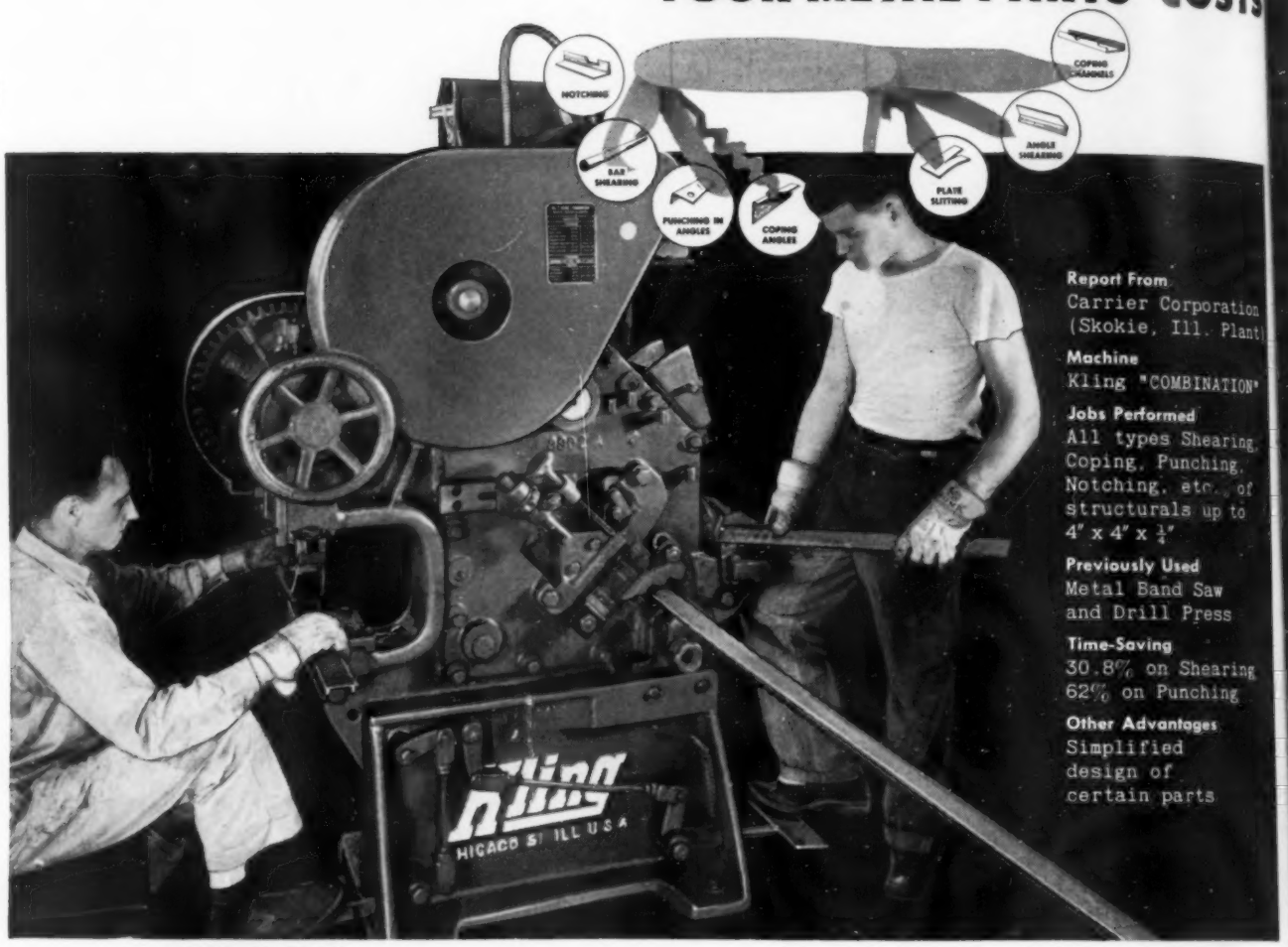

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The Tool Engineer

Saluting Chapter One-One-One

Less than one year ago, ASTE Chapter 100 was chartered as the Northern Massachusetts Chapter. Since then eleven additional significant and outstanding chapters have been installed in strategic industrial centers, culminating with Chapter 111, chartered in September at Muskegon, Michigan.

Each new chapter indicates not only that the Society is healthy and the fastest growing technical society in the world, but also that industrial developments are expanding and that the Society is making vital contributions to the profession of tool engineering.

Every new chapter is the result of a need, the causes of which are many. Some chapters are the direct result of trends in industrial decentralization which develops new manufacturing areas. Others are attributable to new concepts in industry, creating entirely new fields of activity for radically new developments.

Whatever the cause, all new chapters indicate a community awakening to the realization that the service provided by the Society is needed. As better methods are developed and manufacturing techniques are improved, the all-important know-how must be augmented with more and more specialized information. To meet the demands for this increasing specialization, the Society provides the needed channels of communication. Technical developments are made available to the profession through meetings and publications.

Not only have twelve chapters been installed within one year but also there is considerable activity toward the establishment of chapters in Birmingham, Ala.; Mansfield, Ohio; Little Rock, Ark.; Chattanooga, Tenn.; Merrimac Valley, Mass.; Ashtabula, Ohio; Hammond, Ind.; Albany-Troy-Cohoes, N.Y.; Beaumont-Orange-Pt. Arthur, Tex.; Bristol, Tenn.; Battle Creek-Kalamazoo, Mich.; and Sarnia, Ontario.

Congratulations to Chapter 111. It is another milestone of which we are proud.

R. F. Waindle

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necessary. Creative ability is being able to develop

for older men of high potential who

TRAINING
for the job beyond the job

By Frank T. Lewis

Manager, Manufacturing Personnel Development Services Dept.
General Electric Co.
Schenectady, N. Y.

THE TREMENDOUS scope and importance of manufacturing today indicates the need for sound long-range training for specific careers in the field. Those functions that occur after the design and its specification leave the engineering department until the product is shipped are as highly specialized and interrelated as is design engineering. A special type of leader is needed who understands that specialization and interrelationship, and appreciates their ramifications. Industry is growing so fast, and the demands it makes for leaders are becoming so specialized, that the natural development process of the past, of waiting for the natural leaders to come to the top, is no longer adequate.

Manufacturing leadership no longer means one man at the top who has risen there by learning everything about the manufacturing problems of that organization through firsthand experience. There is not enough time and too much to know; too many fields of knowledge in which leadership is necessary; too much progress for any one man to be able to do it alone.

These facts, and resulting plans for training leadership manpower, have made it vital to analyze the different types of leadership that a company, and the manufacturing organizations within it, must have. Roughly, these fall into two groups: the management type and the specialist type of leadership. This latter type, in turn, is supplied by men who can be divided into three main groups: administrative, creative and analytical.

Management leadership is self-definitive. It is the executive guidance that can weigh the evidence and make decisions, look into the future and consider trends in light of their effect upon a business, then choose the best course to meet them.

Specialists are the leaders in the various fields and techniques of business. They are the outstanding technicians who develop the new machines and processes, the routines and the procedures. Upon the degree of leadership they can acquire in their particular technical fields depends in great measure the value and type of the guidance the management of the particular organization can give.

Men to fulfill the requirements of these functions must satisfy one or more of three general requirements. They must either be administrative, creative, or analytically superior. The administrative category is obvious enough; men from this group can readily grow into managers—the professional management class that is developing in industry. The creative and analytical types can find ready outlets for their talents in the specialist classification.

At this point a closer definition of terms may be

necessary. Creative ability is being able to develop new ideas that have practical applications. It is the ability to see the extraordinary in the ordinary, and take commonplace materials, facilities, and equipment and put them to exceptional uses. There are as great needs for creative ability in the various fields of manufacturing as there are in any area of life today. The man who is the creative type and makes his career in manufacturing may never direct an organization of five thousand men, but the equipment and processes he designs, the systems he creates, can play a major part in keeping the men efficiently and profitably employed.

The same goes for the man with the incisive, logical, analytical mind. If he can develop new inventory control systems and production routines, wage rate procedures and cost analyses, if he can analyze existing headaches and remedy them, he will never have to worry about a satisfying, rewarding career in manufacturing.

Foresight: In all cases, though, men for these positions cannot be trained for one job as such. The management-gifted individual must be constantly developing by assuming a variety of duties so that he can take on greater and greater responsibilities; the specialist must be constantly growing in his own field. Instead of training a person for one job, he must be prepared for the one above it. He must always be prepared for the job beyond the job, to the limit of his abilities.

These facts had been realized at General Electric for many years, and several local programs had been developed to meet them, in part at least. But the rapid development of the past two decades brought an intensification of their importance.

In 1929, for example, the company occupied 33 different locations, employed 78,000 people, and did a $415,338,094 business. Today it has 131 plants, employs more than 200,000 people and in 1952 did $2,623,888,000 of business. The products it manuactures now total more than 200,000.

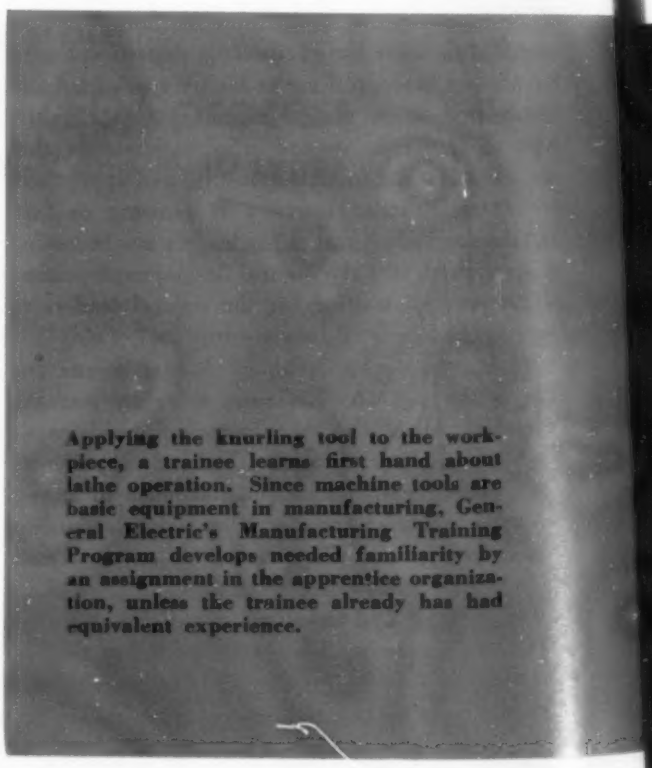
Considered on a company-wide basis, the need for leadership to direct the manufacturing activities of an organization of this size is immense. A few years ago, a survey of less than half the company's organizations showed that within a decade, more than 1500 additional members would be required for manufacturing management alone and that this total would be greater if expansion continued as expected. The number of specialists needed would raise this figure still higher.

The result was a broad program for manufacturing personnel development planned to provide a trained corps of manufacturing leadership. It features training on two levels; one for men just graduating from college or with a few years of outstanding experience in the work force, the other for older men of high potential who already have records of proven accomplishment within the manufacturing organizations.

The latter is an expansion and refinement of several programs that had previously been in existence for the same purpose. The program, however, announced in January, 1952, was completely new. To determine the numbers needed, manpower requirements were again carefully audited. For almost a year, a survey team investigated the type and amount of training that should be given. The group recommended a three-year, two-part program of the rotating-assignment type, with parallel classroom work. The first half was to be an orientation period to develop a broad horizon of the entire field of manufacturing and the latter half was to be a development period according to ability. Finally, it was recommended that candidates be chosen for leadership qualities and requirements previously detailed.

Training programs based on rotating assignments and parallel classroom work are not new. The program, with which GE has been training engineers for almost half a century by having them test equipment before shipment, has been of this type. Four main factors are necessary for success of any training program: (1) the best possible selection of trainees, (2) good administration, (3) good instruction and, (4) the best possible instructional materials.

Possibly the most important, and difficult, of these three factors is obtaining the best students.



Applying the knurling tool to the workpiece, a trainee learns first hand about lathe operation. Since machine tools are basic equipment in manufacturing, General Electric's Manufacturing Training Program develops needed familiarity by an assignment in the apprentice organization, unless the trainee already has had equivalent experience.

been recognized for many months or years. With cluding those having special

Manufacturing is, to a large extent, technical. It translates into finished products the designs and plans of other technical people. To do this requires not only a good knowledge of basic technical and engineering principles but also a knowledge of manufacturing processes as well.

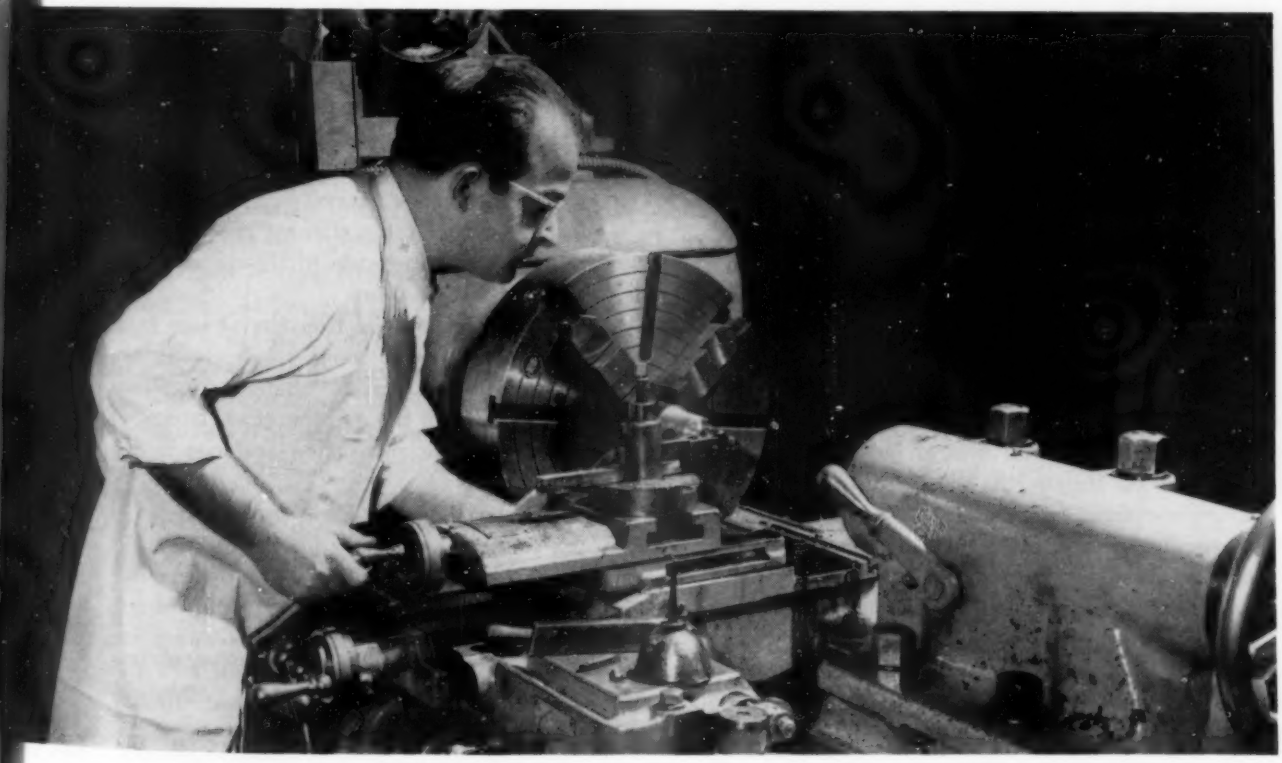
The professional training that fills most of these needs is found either in engineering schools or through completion of a regular apprenticeship and several years of shop experience. Science majors also have many of the desired characteristics as do some business administration graduates. Accordingly, an intensive recruiting campaign was begun, both at the college level and within the company's own work force. Recruiters visited the major engineering schools of the country to find candidates interested in and qualified for the program.

Whether he comes from college or the work force, however, there must be something in the man's makeup that indicates a special kind of potential and capacity that is considerably above average. At the same time, his personality must be compatible with the requirements for manufacturing leadership. Determining just what this potential should be, in what areas it is most important, and measuring the degree to which each individual possesses it, have involved the field of psychological testing as a supplement to the usual interviews and investigations.

Several years ago, when GE first became really interested in specialized personnel development, but at a higher professional level, a firm of consulting industrial psychologists assisted in the development of tests for evaluating the qualities of leadership, imagination and general ability that a leader should have. The result was a series of tests to measure and interpret such characteristics as general intelligence, intellectual development and training (with emphasis on factors like scientific knowledge and mechanical comprehension) critical judgment and leadership abilities, ability to think logically, and general personality traits. These tests have continued in use while work has constantly gone forward to develop new techniques for evaluating the results to suit the company's particular needs.

It is now possible to discover whether a man is the specialist or management type and the approximate limit of his development. These interpretations, incidentally, have been proven accurate by subsequent job performance. These tests are never used as a condition of participation in the program, but they are part of the trainee's personnel record, serving as an aid in planning his assignments, and in counseling and guidance work.

These tests, also, have brought out one especially interesting challenge to management. Among the men selected are several who are especially gifted. To use the talents of these men to the best possible advantage, to plan assignments for them that will present sufficient challenge to keep them interested is in turn a challenge to the program. Without the tests, the potential of these men might not have



been recognized for many months or years. With the knowledge the tests gave, these men can be studied and brought along carefully. One of them may be a future vice-president; lack of attention might let him lapse into a mediocrity.

Instructors, the second of the three major training factors are everyone who affects the development of the trainee's abilities, either in his rotational assignments or in his classroom work. The inspiration and encouragement that he will get from these people will, to a large degree, influence his attitude and progress in the years to come.

Therefore, assignments are carefully planned with but a single thought in mind: development of the trainee to the greatest possible extent. The assignments vary from man to man, according to his requirements and, later, his interests. They cover the entire field of manufacturing so that by the end of his three years the trainee has a firsthand knowledge of all major areas. Generally these assignments begin with a three-month period in the apprentice shop where the trainee goes through the same period and type of instruction that regular apprentices do. If he has had considerable factory experience and is familiar with machine tool work or is a graduate of the apprentice program, he can bypass this particular assignment.

All of the areas in which these training assignments are served, as well as the supervisors, are carefully selected. Trainees are not coddled; they are on regular jobs, the same as other employees. But they do need and are given the guidance of supervisors who are not only extremely competent in the field but are fully aware of the objectives of the training program; perhaps themselves graduates. Reports of these supervisors are carefully checked for important references to particular abilities, or to points that need correcting that can be called to the attention of supervisors on future assignments.

It is at this point in the planning and preparation of assignments to meet particular needs, that the value of careful administration and direction comes in. Because there are so many trainees, so many plants and such wide variety of manufacturing, seven major areas have been set up for training purposes. Each of these areas is in charge of an area representative who directs the operation of the program within it. This insures close individual attention to the trainee. At the present time, each area representative administers the activities of from twenty to forty men. Periodic meetings are held between the staffs of each area to exchange information and data on training matters.

Each of these areas represents a particular type of manufacturing, so that as the trainees rotate they sample different types of manufacturing from custom-designed material to mass-produced units including those having special precision and performance standards.

Classroom sessions are an important part of the program and contribute greatly to its effectiveness. While inherent ability and technical background are important, they are too specialized or nebulous for a broad-based career. Neither engineering training in college, nor experience that candidates from the work force have can provide all of the broad knowledge for a manufacturing career. While the rotating assignments provide much of this background in a diversified company and industry, it is most important that a common groundwork of terminology, procedures and philosophies be developed as a foundation. Classwork gives an opportunity for developing these broad horizons under the direction of instructors who are themselves proved manufacturing experts and can pass on the benefit of their years of experience.

Classes are held for thirty-six weeks a year, with two two-hour sessions each week. Instructors are manufacturing supervisors with outstanding experience and ability, who are able to transmit their knowledge. They are generally chosen for a group of sessions on a particular subject, such as wage-rate, time and motion study, production and inventory control, or manufacturing engineering.

This procedure has two main advantages. Not only does it assure an expert instructor in every field of manufacturing, but it provides a change of instructors so that trainees can become acquainted with various supervisors. This system makes it possible for trainees to profit from the professional experience of leaders who might not be available for long periods of instruction.

Before each group of sessions, the new instructors meet at the company home office for a discussion of the program's objectives, the material to be covered and consideration of the best instructional techniques to use.

Classes are informal seminars, with 12 to 15 men in each. Discussion by the trainees is encouraged and careful records are made of the quantity and quality of this participation.

In view of the necessity of transferring men from one geographical area to another, all classes are held concurrently. A trainee changing locations remains in phase with the evening class portion of the program and the instruction material in his new area.

The text material for these classes was prepared within the company especially for the program. It is divided into eight volumes, each one accommodating the material for a particular group of sessions. The material was written by company experts in various fields, then edited, illustrated and laid out in loose-leaf form for the most effective presentation. Special photo stories are frequently

used to explain a particular technique. Speeches and previously published articles by company experts are reprinted and used with the text as collateral material. In most cases, this material is not discussed in class. Chapters are assigned as background reading for each class session. Class discussion begins on a problem calculated to use what a student has learned from his reading and experience.

Manufacturing leaders with outstanding records serve as instructors in the evening classes scheduled two nights a week from September to June, which are an integral part of the training program. The wide variety of instruction serves to broaden the trainees' industrial horizons.

This basic text is presented from the foreman's viewpoint, not only because in many cases the members will leave the program as foremen, but because the foremen represent the level of management with which trainees come in contact. It is important that the students realize all the aspects of the foreman's job, including knowledge of general manufacturing operations and sound human relations that he must have to be a success.

Examinations given at the end of each group of sessions are not based directly upon the text material, but draw upon the principles presented by the text and developed in the classroom discussions. Examinations are of the case-history type. Each presents a problem in the field that has been under consideration. The essay answers show more clearly than any straight question-and-answer type examination could the degree to which the trainee is grasping the material.

Text material is used only for the first year of program membership. Then it becomes a permanent reference file for the trainee during his two subsequent years in the program. Additional material on the subjects covered by the program, much of it in case-history form, is constantly prepared and distributed to the trainee. Each class session becomes a period for studying these leaflets. Thus, by the time the trainee finishes the program, he will have a complete, up-to-date record of company manufacturing practices and philosophy, and experience in applying and interpreting it to actual problems.

In a program of this type, with the constantly changing assignments and classroom sessions, a great deal depends upon the periodic evaluation of the results and the counseling of the trainees by the supervisors to whom they are assigned, as well as by the members of the training staff. This is done on a carefully established schedule. The trainee's psychological test is reviewed carefully with him. Reports on his work assignments and his instructors' ratings are also discussed. Every time he leaves one area to report to another, his progress is reviewed. It is only in this way that the fullest possible advantage of the program can be obtained by the trainee, and it is only thus that the company can maintain a close watch on the developing abilities of the men on whom it will depend five, fifteen and twenty years from now.

Upon completion of the three-year program, graduates will go into various manufacturing organizations of the company or, in exceptional cases, will be assigned to other programs for further development. This last will occur only in rare cases, however. It is felt that after three years of rotation, no matter how promising a candidate may appear, he should be left to season for a few years

in a manufacturing organization before being offered the opportunity for further training. Not only will the real experience serve him well, but the maturing he receives, and the record he establishes while receiving it, will do much to make the wisdom of his selection at a future date more certain.

Whenever this necessity for future training does present itself, however, it will be accomplished through the supplementary training program which is planned for older men, manufacturing leaders who have already proved themselves and who have indicated by their performance that broadening their training in certain specific areas will benefit both themselves and the company.

These men, too, are placed on rotational assignments, but of a much more carefully selected and individually planned type than the other program. For example, if an inventory supervisor has demonstrated particular ability, but his future is limited because he is deficient in shop experience, labor relations or administrative background, a special effort will be made to develop assignments for him that are away from his home works, and which are planned to give him the rounding out he needs. Generally, men for this program are well into their thirties. The program lasts for approximately two years and may include two to six assignments. Because of the specialized nature of this program and the relatively few members, there are no classroom sessions. The men are, however, encouraged to read broadly in their fields, and books are made available to them through the libraries in the various training areas.

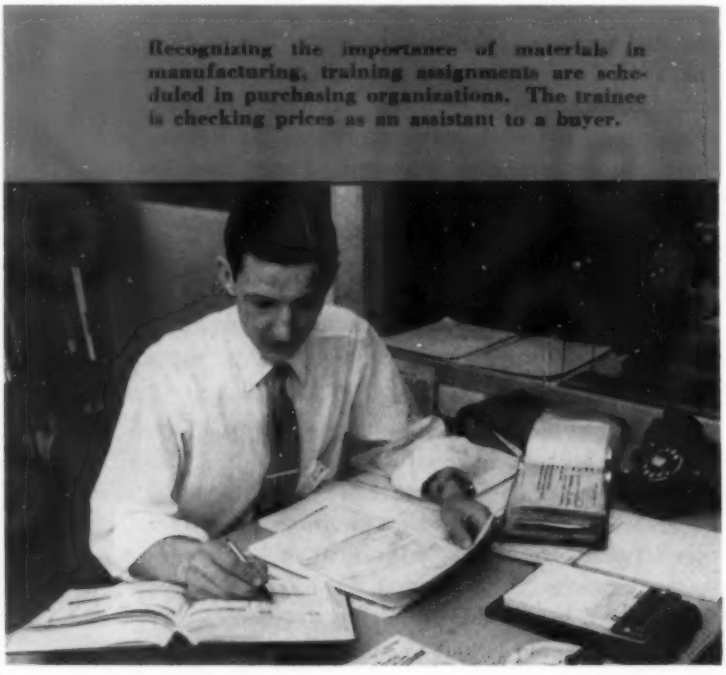
The interest of the manufacturing training program in its graduates does not end with their graduation. It is always of primary concern that their abilities be used to best advantage. Acting as a clearance point for a large percentage of the more responsible manufacturing jobs, the training staff can always be certain that these men are kept in positions commensurate with their real ability and potential.

After only two years of operation of the major program, it is too early to give a definitive appraisal of it. Well over 300 candidates have been recruited and assignments and classrooms established for them. The potential of the trainees has been found exceptionally promising. Many things have been learned in the areas of selection, administration and instruction. For example, at the college level it is easy to pick out the exceptionally talented and those who are obviously not suited for specialized training. In the broad middle ground are many candidates who, if they can be identified and developed, can be the real leaders of tomorrow. They can be identified, it is felt, through an absolute definition of what is wanted in manufacturing leaders, and then finding ways of identifying it, both in the manner of interviewing techniques and testing procedures. It has been learned, too, that there is much talent, frequently unsuspected, within members of the firm's own work force.

Finally, through the medium of the classroom techniques that have been developing, much has been learned on how to instruct trainees and in what to instruct them. This combination of actual on-the-job experience, plus specialized classroom work, is one of the biggest areas being explored, and the direction of it to the greatest advantage is one of the greatest challenges.

It is too soon, again, for a real appraisal of the program, if that is to be given in terms of men developed or dollars saved as a result of that development. That it is on the right track is known from the comments received from company organizations, requests for more trainees, and offers to hire them when they complete the program. But the real answer will come five, ten or twenty years, or a generation from now, in terms of better manufacturing techniques, better administered organizations and a better understanding of the art of developing manufacturing personnel.

It goes without saying that the program, as it now stands, cannot be expected to meet all of the manufacturing leadership needs of the company. There will be, there must always be, room at the top for the man who can rise there through sheer ability, no matter what his origin or background. But the program will serve as a core for the development of sufficient numbers of men who can satisfy the basic leadership needs of the manufacturing organizations of the company in the future.



Recognizing the importance of materials in manufacturing, training assignments are scheduled in purchasing organizations. The trainee is checking prices as an assistant to a buyer.

Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

Height Gage

Assuring users almost gage block accuracy plus a 75 percent saving in time over other methods of inspection, this specially built height gage measures coordinates, milled steps, layouts, precision depths, and diameters. The instrument is also useful in setting precise depths on drill presses, lengths and depths on jig boring machines and cutter spaces on milling machines. Specially designed adapters can widen its applications still further. The gage will measure to an accuracy equal to the micrometer screw, which is guaranteed by its manufacturer to be plus or minus 0.000025 inch. Chromium steel SAE 52100 was used for base *9*, column *10*, and top section *1*, in the illustration, because its coefficient of expansion after hardening is negligible. It was hardened at 1825 F and quenched in oil, drawing at 350 F, thereby stress relieving the vital components of the instrument.

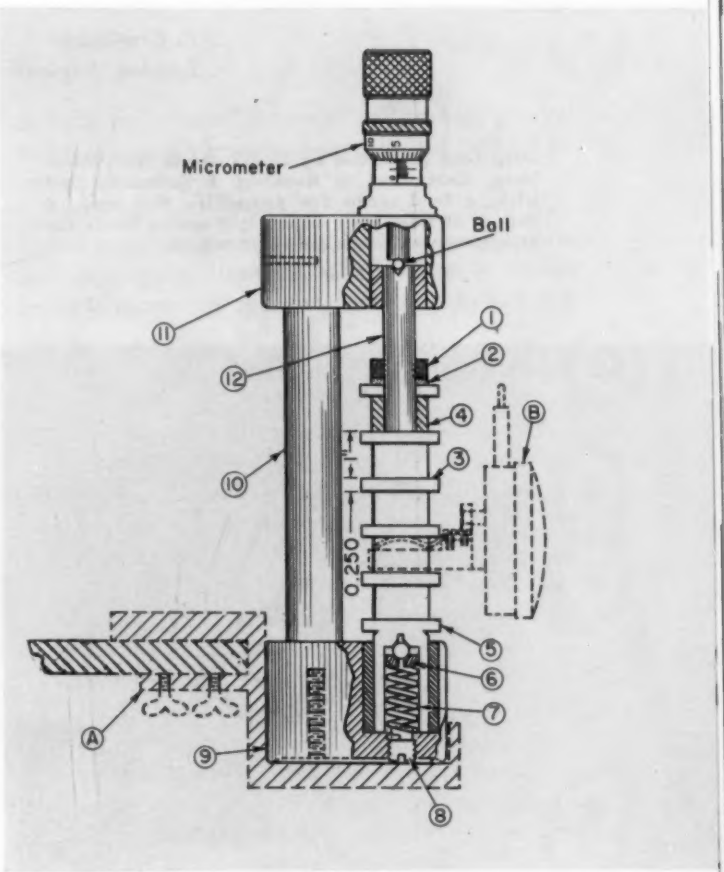
The device includes a commercial micrometer calibrated in 0.0001-inch readings and an antifriction ball set in a 60-degree seat on measuring column *12*. In separating the measuring steps plain oil hardened drill bushing *4* was used.

To eliminate the possibility of distortion a plastic washer *2*, held by fine threaded nut *1*, was inserted as shown. The measuring faces *3* are hard-ground and lapped disks; the bore in the measuring disks and the separating bushing is at least 0.010 inch larger than the diameter of column *12*, thereby avoiding machining problems. No relation exists between the bore and the faces of the measuring disks, or the bore and the face of the separator.

The first measuring face is integral with the measuring column. This column is bored to house an adapter *6*, that molds the lower antifriction ball securely by means of spring *7*, which prevents lost motion and backlash. After seven months of constant use wear on the micrometer screw proved to be negligible. It is compensable to certain limits, but this is an unimportant feature since the micrometer is replaceable and inexpensive.

No special skill is required to use the instrument: ability to read a micrometer is sufficient. The first step will measure exactly three inches when the micrometer reads zero. If the work is placed on a parallel three inches high, the first measuring face will be in line with the work. Measuring faces are one inch apart. Movement of the micrometer affects all the measuring faces. By using an indicator mounted on a surface gage, or any other type of holding device, it is possible to transfer the reading of the micrometer to the work. The measuring faces are lapped on oth sides so readings can be taken from the bottom side, in which case 0.25 inch must be deducted from the micrometer reading.

It is best to inspect work from a parallel; if necessary to inspect work directly from a bench plate, the instrument may be lowered into a holding fixture A in the figure. Thus, when the micrometer



reading is zero the first measuring face will be on the same plane as the surface plate. Readings can then be made from zero in steps of one inch and subsequent micrometer readings in increments of

0.001 or 0.0001 inch as desired.

Shown at B is a simple application of an indicator to establish precise depths for a drill press, or a milling machine. Since the measuring column travels up or down without rotating, it is not necessary to remove the indicator to change the height of the gage.

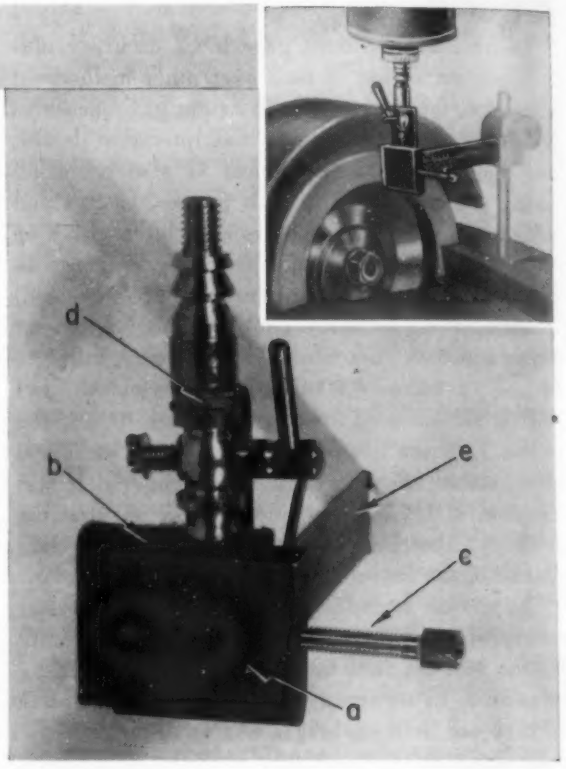
Interchangeability by standardization of parts was considered in designing this instrument. One major change that could be made would be to use cast steel for the body to further reduce the cost.

Thomas J. Bizzoco
ASTE, Greater N. Y. Chapter

Drip Feed for Diamond Wheels

Some authorities recommend keeping the face of diamond grinding wheels wet for prolonging their life. See THE TOOL ENGINEER, pp. 45-47, Oct. '52. A felt wick is often used with a standard lubricator for this purpose. The Winter Tropfenspender (drip feed) is a device that provides more positive regulation of the wick against the wheel by spring pressure. It consists of a rectangular housing fixed to a spring strip into which a rectangular felt piece is fitted. A steel pad and screw insure correct pressure of felt against the grinding wheel.

P. Grodzinski
London, England



Drip feed produced by E. Winter & Son, Hamburg, Germany: *a* housing, *b* prismatic felt wick, *c* feed screw for propelling felt wick, *d* supply of fluid with stopcock, *e* spring blade for attaching device on grinding wheel.

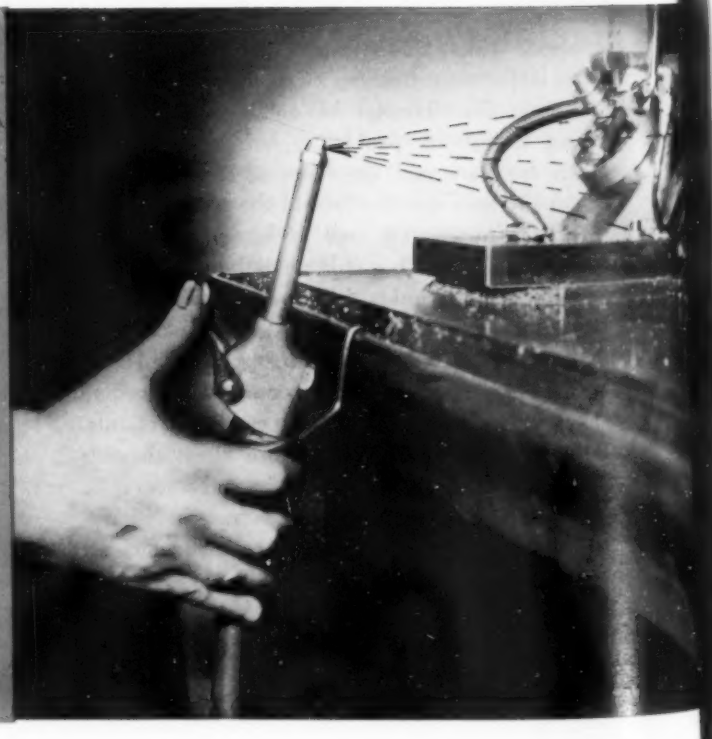
Blowgun for Cleaning Jigs

The conventional blowgun has the air outlet at the tip of the nozzle, and in most instances, especially in high production operations, is inconvenient to use because it must be picked up and the nozzle directed downward toward the workpiece, jig or fixture.

A simple improvement can be made by closing the original outlet by solder and drilling a new hole at 90 degrees to the axis, bringing the air blast in line with the work.

In the application shown in the photo, a 1/16-inch hole was drilled and a short piece of stainless steel tubing installed in the nozzle as a further refinement. With this change, the gun hangs on the edge of the drill press table and the handle is merely pressed to direct the air stream on the valve parts for cleaning.

K. L. Schlesinger
ASTE, Los Angeles Chapter



Magnesium Forming

Part 1—General Considerations

By Francis L. Coenen*

General Supervisor, Tool Research Group
Pilotless Aircraft Div.
Boeing Airplane Co.
Seattle, Wash.

Much known technical information is valueless because it is not available to all members of a production organization. Information for this series of articles has been gathered over a period of time by Boeing so that planners, designers and production men will all have access to the most recent information on magnesium and the methods of working it. The purpose of these articles is to present some general rules, based on a mass of records, tests and remembered experiences, that may serve as a guide to those planning magnesium tools and processes.

MAGNESIUM ALLOY is a fairly new metal but because of its light weight, good machinability, low cost-per-volume ratio, its unlimited supply and high strength-to-weight ratio, it is rapidly finding a place with aluminum and steel as a raw material used in volume. Increased production with magnesium is making possible continued improvements in shop procedure, which, along with constantly improving alloys, mill methods, protective treatments and reduced costs, is firmly fixing magnesium alloys as important materials for use in applications where low weight and low cost are important factors. *Fig.* 1 shows a section of a typical magnesium fabricating plant and some of the equipment that can be used to form the metal. This series will provide general information on planning tooling for the fabrication of magnesium.

Producers of magnesium alloys each have individual numerical and name codes to identify alloys and/or tempers. However, all alloys can be related to the governmental specifications shown in TABLE 1.

Fig. 1. Magnesium airplane nacelle fairings are made in the free fall press in the right foreground. At the left is an oven, mounted on wheels so it can be moved wherever needed.

*Senior member ASTE Seattle chapter

Table 1—Typical Physical Properties and Usage

Form	Alloy Spec.	Purch Cond.	Form Gage Cr Section Area	Mechanical Properties (1000 psi)						Usage
				Tens. Ult.	Tens. Yield	Comp. Yield	Bear. Ult.	Shear Ult.	Elong. % in 2 in.	
Sheet and Plate	QQ-M-44	Cond. A	Sheet 0.020 - 0.250 in.	32	15	13	45	17	12	For formed parts and general usage
				39	29	24	58	18	4	
		Cond. H	Plate 0.251 - 0.375 in.	35	25.5	21	51	16	6	
			Plate 0.376 - 0.4375 in.			19				
			Plate 0.4376 - 0.500 in.			18				
			Plate 0.501 - 0.750 in.		24.5	17	50		8	
			Plate 0.751 - 1.00 in.	33.5	22.5	15.5	48	15		
Extruded Tubing	WW-T-825	As Extr	Wall 0.050 - 0.250 in.	32	16	10			8	General usage
	MIL-M-5354	Ea	Up to 5 sq. in.	46	38	26			4	High-strength parts
Bars Rods and Shapes	QQ-M-31 Comp AZ31B		Bar, Rod 0.250 - 2.50	32	20	14		16	7	General usage
			Shapes 0.250 - 2.50	32	20	11		18	7	
	MIL-M-5354	EA	under 2 sq. in. from 2 to 3 sq. in. from 3 to 5 sq. in.	45	36	30 28 25			4	Hi-strength parts only
Forgings	QQ-M-40 Comp AZ80A	F		42	26	18		20	5	Press and hammer forgings
	QQ-M-40 Comp TA54A	F		36	22	16		15	7	Drop-Hammer Forgings
Sand Castings	MIL-M-4204	Cond. T4		32	10	10		17	7	Use for pressure-tight castings only
		Cond. T6		34	16	16		20	3	
	QQ-M-56 Comp AZ63	Cond. HT		34	10	10	41	17	7	General usage
		Cond. HTA			16	16		19	3	
Perm Mold Castings	QQ-M-55 Comp AZ92	Cond. HT		32	10	10	41	17	6	General usage
		Cond. HTA		34	18	18		20		
Die Castings	QQ-M-38			30	20	20		18	2	Typ. properties not design minimum

Key

A—Annealed
H—Hard rolled
EA—Extruded and aged
F—As forged
HT—Heat treated
HTA—Heat treated and aged

Each of the magnesium alloys has special properties and is used for particular applications, TABLE 1. Of almost equal importance when forming parts are the characteristics of magnesium alloys at elevated temperatures. *Fig.* 2 indicates the characteristics of QQ-M-44-A (annealed) at temperatures up to 600 F.

Rolled magnesium alloys, with the exception of pure magnesium, normally are supplied with a chrome-pickle finish. Sheet magnesium that is to be formed with the use of colloidal graphite lubricant should be obtained in the oiled rather than the pickled condition. Graphite can be readily removed from oiled surfaces but is difficult to remove from pickled. The protection imparted to magnesium sheet by oiling is only slightly less than that given by the chrome-pickle under normal shipping and storing conditions.

Corrugated cardboard should not be used between sheets of magnesium when they are stacked for storage or transport. It has been found that the corrugated cardboard corrodes the magnesium. When protection is required, specification JAN B-121, Grade A, Class I paper can be used. When it is necessary to reoil magnesium sheet, ANC, Type I solvent type grease is used.

Before magnesium parts can be formed, suitable blanks must be prepared. Magnesium up to 0.250 inch can be sheared, but acceptable sheared edges for magnesium parts can only be obtained on annealed magnesium up to 0.081-inch thickness or on hard rolled magnesium up to 0.064 inch. Annealed magnesium over 0.081 inch and hard rolled magnesium over 0.064 inch should be routed to size.

If the thickness is not greater than 0.250 inch, magnesium can be sheared oversize and the blanks shaped to finished size. For acceptable sheared edges, the clearance between the blades should be held between 0.001 and 0.003 inch and the blades should be kept sharp.

It should be remembered that in many instances parts are trimmed after forming so that the sheared edge will be removed as part of the regular production process. If a trimming step is required, blanks can be sheared oversize. Heating magnesium sheet

prior to shearing improves the quality of the sheared edges but the improvement obtained is not commensurate with the cost of so doing, including equipment costs. Therefore, most magnesium is sheared at room temperature.

Magnesium up to 0.250 inch can be blanked, but acceptable blanked edges for magnesium parts can only be obtained on annealed magnesium up to 0.064 inch or on hard rolled magnesium up to 0.032 inch. Heating of the magnesium during blanking has little or no effect on the blanked edge.

Magnesium up to 0.250 inch in thickness can be punched but acceptable punched edges are only obtained in thickness up to 0.156 inch where punches are ¼ inch or less in diameter. Heating the magnesium has little or no effect on the punched edges.

Alloys of magnesium are readily cut with power band or circular saws, as well as with hand or power hack saws. Band saws should be provided with nonsparking blade-guides and an adequate system to minimize the danger of sparks igniting the magnesium dust created. Friction saws are not recommended for use on magnesium because this type of sawing could ignite the dust. All saws should be thoroughly cleaned after cutting magnesium.

Magnesium has a low cutting pressure, so larger and faster cuts can be taken per tooth than are possible with other metals. Too small a tooth pitch or space will cause the saw to ride over the work and rapidly dull the saw teeth. Recommended tooth spacing for various types of saws, and values for tooth set and relief angles are shown in TABLE 2.

The set of teeth must be relatively large and relief angles on circular saws should be adequate to minimize friction. The special tooth profiles, developed to give circular saws a better cutting action, work well for magnesium. To obtain good service life on saws, high-speed blades should be used on all saws except circular saws, where carbide tipped blades give superior service life.

Magnesium alloys are safe to work with except when molten or in finely divided form. Industrial magnesium fire hazards result from powder, dust or fine chips that are generated during all cutting operations. Certain precautions should be taken when cutting magnesium to prevent the possibility of ignition of chips or explosion of dust accumulations.

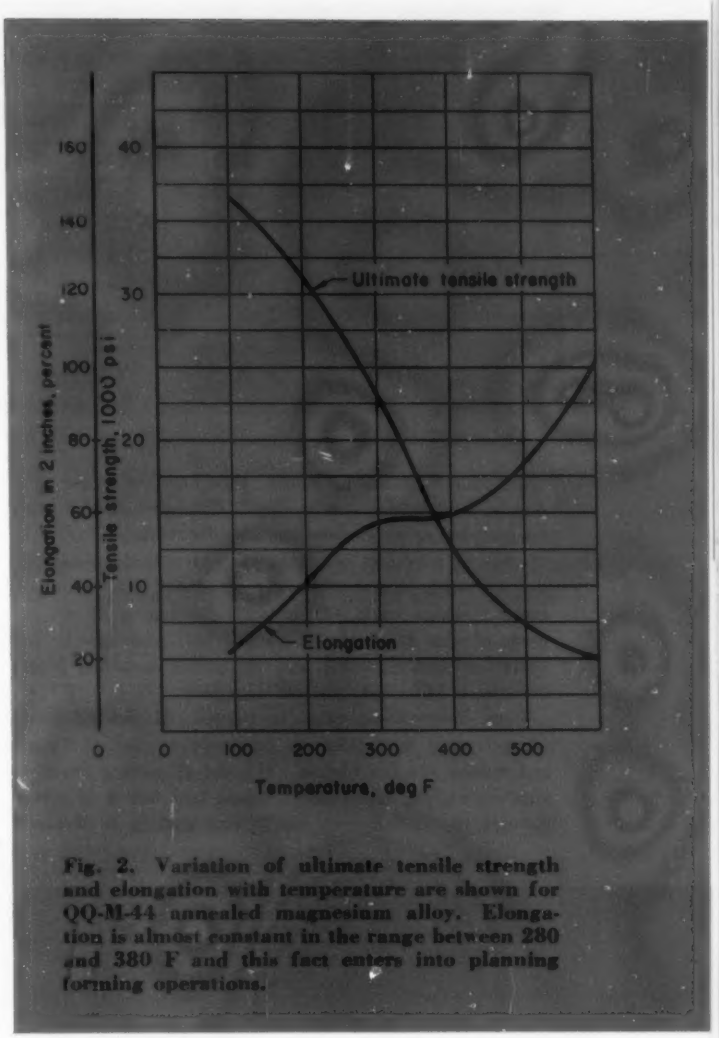


Fig. 2. Variation of ultimate tensile strength and elongation with temperature are shown for QQ-M-44 annealed magnesium alloy. Elongation is almost constant in the range between 280 and 380 F and this fact enters into planning forming operations.

1. Chips should be removed from clothing, machine and floor continually and should be stored in a covered metal container. It is advisable to mark the containers "Magnesium Only."
2. Tools should be sharp and have proper cutting angles.

Saw Element	Type of Saw: Circular Saw — Set Teeth	Circular Saw — Beveled Teeth	Band Saw	Power Hacksaw	Hand Hacksaw
Teeth per Inch	½-2	½-2	4-6	2-6	12-18
Tooth Set, Inches	0.02-0.05	0.02-0.05	0.02-0.05	0.015-0.03	——
End Relief, Deg.	10-12	10-12	10-12	——	——
Side Relief, Deg.	4-6	4-6	——	——	——
Clearance, Deg.	20-30	20-30	20-30	20-30	20-30

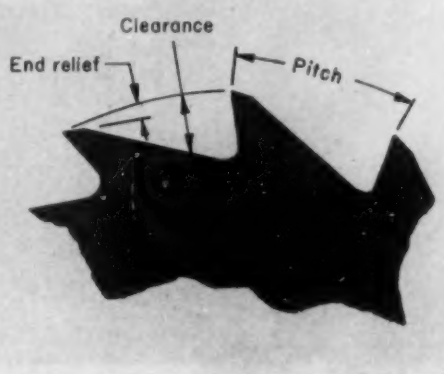


Table 3—Difference per Inch of Expansion Between Magnesium and Tooling Materials

Material	Temperature Range					
	100 F	200 F	300 F	400 F	500 F	600 F
Steel	—0.00020	—0.0010	—0.0018	—0.0034	—0.0034	—0.0038
Aluminum	—0.00004	—0.0002	—0.0003	—0.0005	—0.0006	—0.0007
Cast Iron	—0.00025	—0.0011	—0.0020	—0.0029	—0.0038	—0.0042
Kirksite	+0.00002	+0.0001	+0.0002	+0.0003	+0.0004	+0.0004
Brass	—0.00010	—0.0005	—0.0010	—0.0014	—0.0018	—0.0020

Note: — Expansion less than magnesium
+ Expansion greater than magnesium

3. Cuts should always be heavy. Fine cuts can cause ignition at high cutting speeds. Tools should be backed away from revolving work when not actually cutting.
4. A cutting lubricant or liquid coolant should be used in the following instances: (a) reaming, (b) automatic screw machine work, (c) in parts tending to distort because of slow dissipation of cutting heat generated by the operation and (d) for the smoothest possible finish. Otherwise, lubricants are not necessary.

   Tests have shown that the purpose of cutting fluids when cutting magnesium is primarily to cool the work and reduce the fire hazard. The use of cutting fluids to improve surface finish and increase tool life is of minor importance. Satisfactory magnesium cutting is obtained by using cutting fluids containing an anhydrous oil with a low acid content. This oil should have a specific gravity of 0.79 to 0.86 and a viscosity of 4 to 5 gpm at room temperature. This viscosity should not change when the oil is subjected to temperatures up to 100 F, for periods not exceeding 55 seconds. A compromise between cooling capacity and flash point should be maintained on the cutting fluid.
5. When cooling is necessary, the use of compressed air instead of a liquid coolant is frequently satisfactory. If compressed air is used as a coolant, the air valve should be closed immediately in case of fire.
6. Use of oil-water emulsions (soluble oils) should be avoided because of possibility of explosion.
7. General cleanliness should be intensified in magnesium cutting areas because oil-soaked floors and dust represent additional fire hazards.
8. When grinding, if possible, a lubricant, or water if no lubricant is available, should be used. Water must be used in large volumes to prevent sparks and should flush the grinding dust away from the work and into a sump.
9. When grinding without lubricant or water, dust exhausting equipment with high air speed (80-100 fps) should be employed and grinding dust should be precipitated into water immediately after leaving grinding wheel.
10. The sludge-like mixtures of water and magnesium dust are explosive and should be caught in a sump or settling tank. They should be kept under several inches of water until they are taken out and burned. Since these sludges can generate hydrogen gas, the sump should be vented.
11. The outer clothing of the operator should be a hard surfaced fire resistant garment that is without pockets, cuffs or parts capable of collecting magnesium dust or fine chips. It should be easily removed and can be made of leather or asbestos.
12. Sparking should be avoided. Magnesium should not be ground on the same wheels used for grinding steel.
13. Polishing should be done only in cabinets equipped with dust collecting systems.

Fig. 3. Heating of both flat blanks and partially formed parts can be accomplished in this circulating hot-air oven. The parts are placed on the wire-mesh shelf and the oven is accurately controlled thermostatically.

Table 4—**Minimum Inside Bend Radii for Magnesium Alloys, Inches**

Gage (inch)	QQ-M-44 Annealed		Hard	
	550 F	Room	Room	325 F
0.016	0.06	0.09	0.19	0.09
0.020	0.06	0.09	0.19	0.09
0.025	0.06	0.13	0.25	0.13
0.032	0.06	0.16	0.32	0.16
0.040	0.09	0.19	0.38	0.19
0.051	0.09	0.25	0.50	0.25
0.064	0.16	0.32	0.62	0.32
0.072	0.16	0.38	0.82	0.38
0.081	0.19	0.44	0.82	0.44
0.091	0.19	0.44	1.00	0.44
0.102	0.25	0.50	1.00	0.50
0.128	0.25	0.63	1.25	0.63
0.156	0.38	0.75	1.63	0.75
0.188	0.38	1.00	1.88	1.00
0.250	0.50	1.25	2.50	1.25
0.312	0.75	1.75	3.12	1.75

14. In the event of a magnesium fire, water and liquid extinguishers should not be used. Water makes magnesium burn more violently. An adequate supply of talcum powder, or equivalent material, should be available and easily accessible in each area where magnesium is cut. The powder is used to cover the burning magnesium and prevents entrance of more oxygen.
15. Any magnesium fire should be localized by scraping away adjacent turnings or chips.
16. If possible, contact between burning magnesium and concrete floors should be avoided.

Magnesium has good forming properties when it is hot. Cold forming is quite limited when compared to hot forming. Although cold forming is less expensive than hot forming, severe shapes cannot be cold formed in magnesium.

One of the important considerations when designing tooling to be used for hot forming magnesium alloys is the relationship between the coefficients of thermal expansion. The average coefficient for magnesium alloys is 0.0000145 inch per inch per degree Fahrenheit or 0.000156 inch per foot per degree Fahrenheit. As can be seen in TABLE 3, the differences per inch of expansion between magnesium alloys and tooling materials are significant; especially for Kirksite, which has an expansion greater than magnesium.

There are many types of heating equipment used for the hot forming of magnesium. Some of these are built into the forming equipment and some consist of separate ovens as shown in *Fig.* 3. A typical

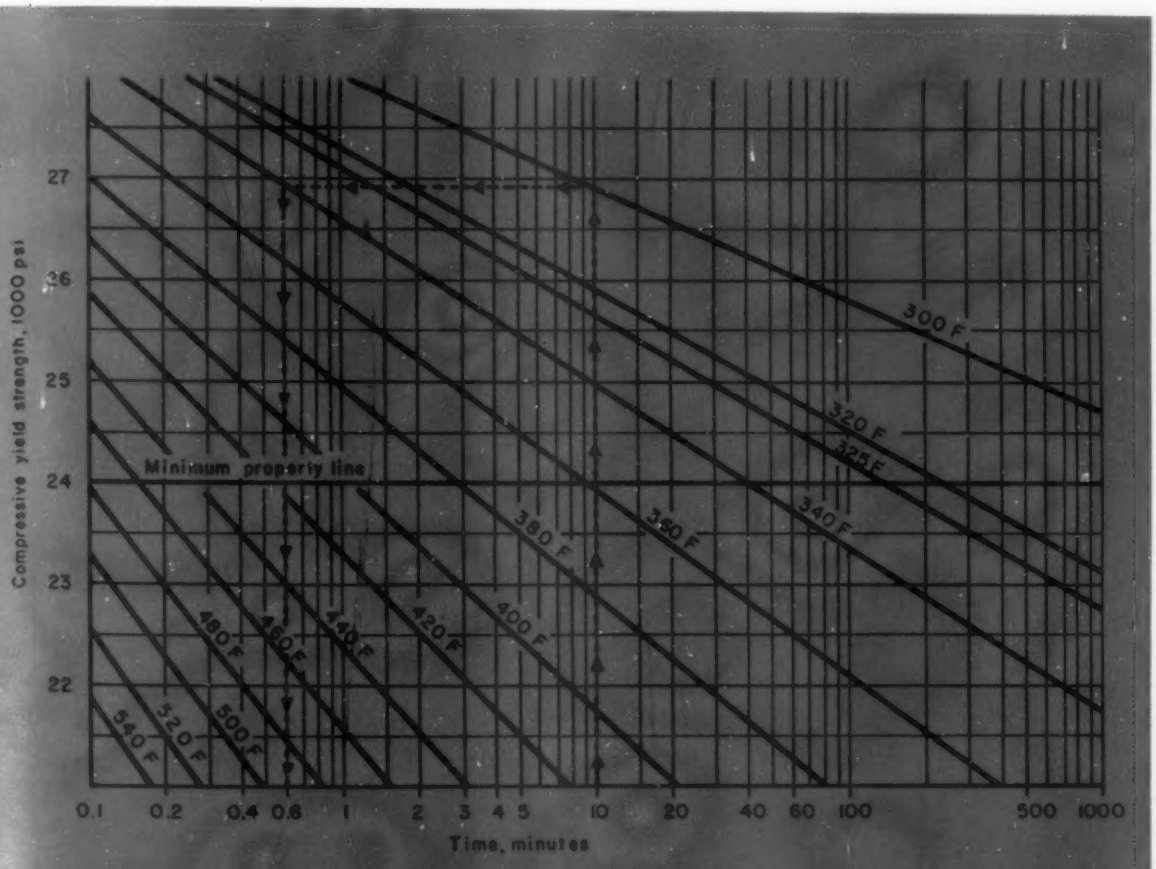


Fig. 4. Room temperature properties for QQ-M-44(H) after exposure to elevated temperatures are shown in terms of compressive yield strength.

heated stretch-block would have a heating element core consisting of steam pipes cast into the die material. Restrictors are placed at the inlet of the longitudinal pipes to insure an equal flow of steam through each pipe. These restrictions each have an opening, equal to the area of the inlet pipe divided by the number of longitudinal pipes.

The usual design of parts to be formed from magnesium practically precludes their formation at room temperature. Experience has shown that even if the forming operation is possible at room temperature, it can be done better at elevated temperatures.

The unique properties of magnesium require that a different line of reasoning be followed with them than that used for aluminum and steel alloys when considering forming methods. Briefly, their tensile yield and ultimate strength are greatest at room temperature when the magnesium alloys are in the cold worked condition. Naturally, their elongation is greater in the annealed condition. As the temperature is increased, the increase of elongation in the H (hard rolled) almost parallels that of the O (annealed).

It is seen in *Fig.* 2 that elongation is nearly constant in the temperature range 280-380 F. Maximum benefit of temperature with respect to reduction of minimum bend radius, TABLE 4, is obtained at the limiting temperatures, but maximum increase in benefit is obtained between 250-300 F for cold worked and 200-300 F for annealed alloys.

In operations requiring a given strength at elevated temperature, it is well to note that in these temperature ranges, the tensile strength decreases sharply and almost linearly; hence, it may be reasonably assumed that for either condition, the best temperature for stretching is nearly 300 F. Experience has proved this assumption to be true.

In any production operation involving temperatures above room, consideration must be given to the physical comfort of the operator. When selecting tooling, this should be considered because large masses at high temperatures provide large radiators of heat with resulting disagreeable working conditions. Whenever the heated mass can be kept to a low value this is to be desired for time, power or fuel costs, and tempers (of personnel) can be saved.

Any operation that requires magnesium to be moved over any surface under pressure must be closely watched for lubrication requirements. Mag-

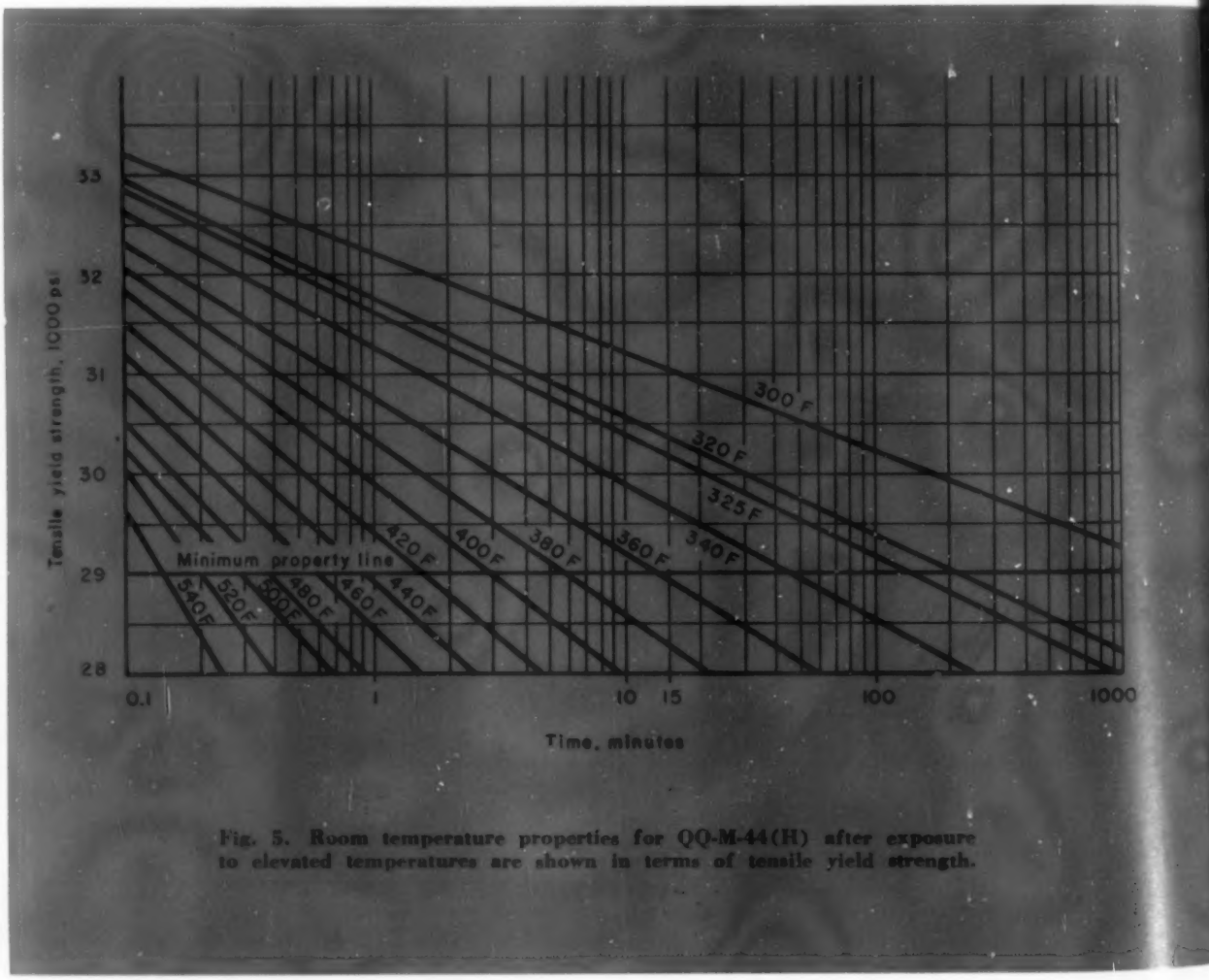


Fig. 5. Room temperature properties for QQ-M-44(H) after exposure to elevated temperatures are shown in terms of tensile yield strength.

nesium also can be scratched by and gall on softer surfaces which conditions are aggravated by any increase in temperature.

Prolonged high temperature heating of magnesium has detrimental effects on its physical properties. Most of the information on forming in this series of articles will pertain to the QQ-M-44, non-heat-treatable alloys. It is furnished in two conditions—cold worked for higher mechanical properties, and fully annealed. The cold worked material is usually formed at room temperature or 325 F±15 degrees and the annealed material is ordinarily formed at either room temperature or 550 F±25 degrees. The direction of grain of magnesium does not appear to have any significant effect on its forming properties.

Deviations from these recommendations can sometimes be allowed. One deviation is the substitution of the cold worked material for the annealed with the stipulation that to facilitate forming, it may be heated to 550 F for a period up to one hour. This substitution results in reduced room temperature properties and is only done in parts where this loss of strength will not be important.

Magnesium has the property, with respect to strength, of integrating time with respect to temperature. Limits have been determined by the metal producers from which heating periods, maximum time at temperature, have been evolved. It is for this reason that when the cold worked alloy is substituted for the annealed, and is heated to 550 F with a 1-hour time limit, it is known in advance that the room temperature properties will suffer.

It should be emphasized that the times and temperatures previously mentioned are maxima and do not limit the selection of lower temperatures and/or shorter times, if the parts can be successfully formed in all other respects. As will be shown later, in the discussion of stretching operations, another optimum temperature does exist for annealed magnesium alloys. It is found in the same range as the maximum allowed for cold worked alloys.

In drop hammer forming, total time at temperature may be an important factor because considerable time must elapse in each heating cycle. If a large number of strikes must be made, say ten, and the heating cycle is about 5-minutes, then it may be well to calculate the time-temperature equivalent at maximum design temperature. This can be done as follows for QQ-M-44 cold worked: (a) disregard time at temperatures under 300 F, (b) from *Fig.* 4 or *Fig.* 5 select that property represented by the intersection of the required compressive or tensile yield strength for 15 minutes at 325 F.

Any proportional period of the time used at that temperature can be added to another period so calculated. If the total time equivalent does not exceed the 325 F allowed time, then the part can be made that way without question. If the equivalent at 325 F does not exceed the 15-minute equivalent of 340 F, the part might be all right. Parts made using cycles taking longer at temperature than this may still be made, but will require close inspection.

The following numerical example illustrates calculation of time-temperature problems.

Consider: A sample has been heated at 300 F for ten-minutes.

Determine: (a) Maximum allowable time at 340 F if the compressive yield strength at 340 F for 15 minutes is the criterion, (b) maximum allowable time at 300 F with the same criterion and (c) maximum allowable time if 400 F is reached for 0.2 minutes.

Solution: (a) Read across the time scale, *Fig.* 4, to 10 minutes, then ascend vertically to the 300 F line Proceed horizontally to the left to the 340 F line and descend vertically to the time scale. The value obtained, 0.6-minutes, indicates the equivalent time had the temperature been at 340 F instead of 300 F. Thus, the available time is 15 — 0.6, or 14.4 minutes. (b) Using the same method, it can be seen that 15 minutes at 340 F is equivalent to 1000 minutes at 300 F. Available time at 300 F then equals 1,000 — 10, or 990 minutes. (c) 0.2-minutes at 400 F equals 150 minutes at 300 F. Available time at 300 F then equals 1000 — 10 — 150, or 840 minutes.

Magnesium is particularly susceptible to the rate at which it is loaded. As the speed of loading increases, so does the tendency to rupture. There is a definite lessening of elongation on some other materials as rate of loading is increased, but this is greatly exaggerated with magnesium. Impact loading, as exemplified by the drop hammer, is the practicable upper limit of loading speed.

Rate of loading is a major tooling consideration whenever it can be controlled. However, most forming machines allow little or no control of the speed of operation and certain speeds are inherent characteristics of specific machines. Characteristics of the machines available have a bearing on which is selected as the tooling for a particular part.

To some extent, magnesium can be formed over a wider range by the use of incremental forming methods. This process may be accomplished by inching, as in a press. Staging in drop-hammer forming is another example. Hard magnesium cannot be successfully hammer formed. The hammer forming of annealed magnesium is almost always done in the heated condition.

In magnesium forming, the holding of the material for an interim period at the prescribed forming temperature, or the reheating to forming temperature affords a manner of reannealing.

A better analysis of the problem of forming magnesium can be made on the basis of the individual machines involved, as will be done in the remainder of this series. Methods and problems will be taken up process by process.

International Machine Tool Show

By Athel F. Denham
President, Denham & Company, Detroit

TO AMERICANS AND CANADIANS visiting the Brussels Show, with its 3,000 machine tools and a million square feet of building area, the narrowing of the gap between American-made machine tools and those produced abroad is evident. The Brussels show served warning that American industry cannot stand still and maintain manufacturing leadership. Some of the trends, noted in European equipment exhibited at Brussels, include:

GREATER RIGIDITY: Compared with machines produced only two or three years ago, those at Brussels revealed a marked increase in rigidity and a resulting ability to take more punishment in production service while maintaining accuracy. Such items as hardened and ground ways, rather uncommon a few years ago, are now in general use.

HIGHER TOP SPEED: Optimum operating speeds of European machine tools have been increased considerably. Often, speeds are equal to those of corresponding equipment in the United States. This is particularly true of machines with reciprocating mechanisms such as shapers and grinders. A great deal of work has been done in the direction of obtaining better performance with power at high speeds through hydraulic, pneumatic, and other actuating mechanisms.

MORE AUTOMATIC CONTROLS: Considerable progress has been made in electrical and electronic controls. On many machine tools manual controls have been replaced by such devices, making them more operable by unskilled and semiskilled labor. Many more machines are equipped with selective and automatic controls than those exhibited at previous European expositions. Controls employed are of various types, including pneumatic, electric, and electronic for many different types of machines such as boring mills and gear hobbers. Many machines are equipped with automatic sizing and other automatic and semiautomatic inspection devices. A large number of tool grinders are equipped with optical comparators for controlling the actual grinding operations. Many lathes and other machines are equipped with tracer attachments.

Many European equipment manufacturers, particularly those producing small equipment, apparently are offering more models than are usually manufactured in the U.S.

Unit construction is a definite trend among European machine tool manufacturers, using standardized units to create a variety of machine tools by mounting them on special beds, tables and columns. This development has facilitated the entry of European producers into the specialized machinery field without the extensive cost of designing and building special machines from the ground up.

With but few exceptions, European machine tools exhibited at Brussels have exterior finishes superior to those normally used on American machine tools.

Carbide tools are used extensively, matching the increase in operating speeds of the machines. There were not as many exhibits of gages and instruments as might be expected at a large exposition. The British, incidentally, have developed a considerable amount of instrumentation of a combined precise and universal character to serve many purposes.

If the manufacturing equipment on display at Brussels is taken as a criterion, European industry is on its way toward greater mechanization. Certainly the machines evidence a desire to place greater responsibility for production quantities and quality on the machine rather than on the worker.

Dominating the Brussels exposition were the West German manufacturers, with practically half of the total exhibit space. Progress of the West German machine tool industry has been phenomenal since the end of World War II. Since the industry had no plants, no equipment of any nature at the time of the Armistice, creation of the new industry has been completely from the ground up without being tied down in any way by previous limitations as to plant, equipment and designs. As a matter of fact, the industry has grown so large that it has outgrown its present markets. It is obvious that it will contract to some extent or seek new markets.

This is the third successive annual show held in Europe. Consequently, there has been little time between the last show and this one for the development of new equipment. After the 1954 show in Milan, the European industry will take a 3-year rest before holding another international exposition.

economies of tooling and lathe selection

By E. L. Murray

The Warner & Swasey Co.
Cleveland, Ohio

A FORMIDABLE NUMBER of turret lathe production hours are wasted annually by American industry because work is not assigned to the proper type of machine. To accurately determine which machine should handle a specific job requires careful analysis of the job order and the machines available. Past experience, rules of thumb and personal prejudices may place jobs on widely different machines than will an objective cost analysis.

Misuse of turret lathes has resulted in the creation of possible profit reservoirs. Discovery of such sources of increased output at reduced expense—without capital expenditure—is an individual task for each shop, but the following article outlines the universal method of approach.

Machine Selection

Selection of the correct machine for each job offers the greatest opportunity for improved production economy and should be the first area investigated. How should turret lathes be picked for specific jobs? To illustrate factors affecting selection of the proper machine, production of a stud shaft will be considered. The stud shaft is a simple workpiece and is typical of many jobs that are suitable for small turret lathes.

Primary requirement for the job is a lathe with a capacity of at least 1½ inches through the collet chuck. There are at least three turret lathes that can be used to produce this stud shaft, and the class of parts it represents: (1) a No. 3 Ram Type, (2) a No. 4 Ram Type and (3) a No. 3 Electro-Cycle, *Fig.* 1. These machines represent a wide variation in available horsepower and ease of handling, with some variation in initial investment.

With an all-geared head, the No. 3 Ram is the least expensive universal turret lathe suitable for producing this stud shaft. It is easy to work and is equipped with a 10/5-hp two-speed motor.

Since a large group of tool engineers advocates the use of more and more power, to the exclusion of ease of machine handling, the 2-inch capacity No. 4 Ram equipped with a 15/7½-hp motor is

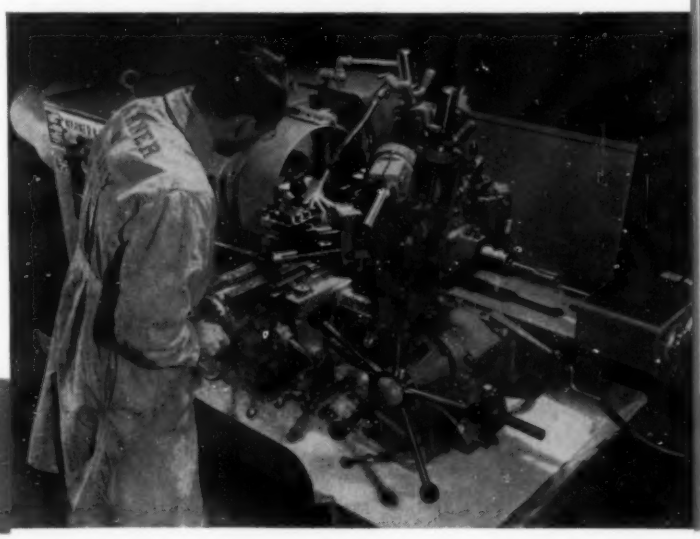


Fig. 1. An Electro-Cycle lathe is included in the group of three machines to represent those designed for reduced handling time.

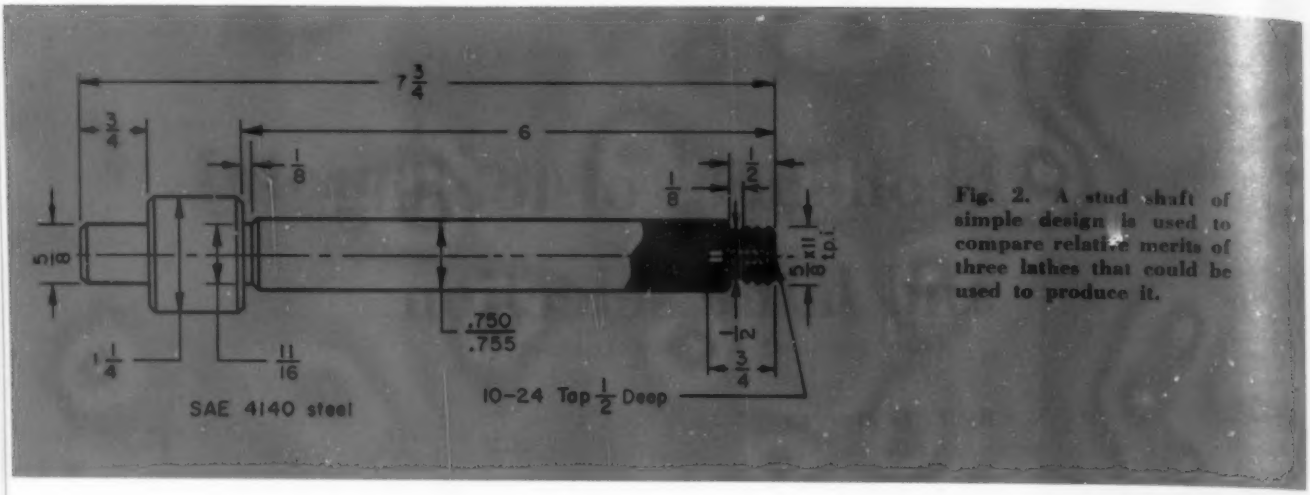


Fig. 2. A stud shaft of simple design is used to compare relative merits of three lathes that could be used to produce it.

included as a possible tool for manufacture of the subject part. The motor for this lathe is designed for a 50-percent overload for no more than 50 percent of the cycle so that a machine with a peak of 22 hp is included in the group.

The Electro-Cycle lathe offers optimum machine flexibility with some sacrifice in power available. It is the most expensive of the three lathes by a small amount. Fundamental design of this machine is aimed at reduction of handling time in a job cycle.

Based on the single factor of flat time in minutes per piece produced, TABLE 1, the No. 4 Ram, with a 2.96 cycle is apparently the most effective machine. It would seem that jobs such as this stud shaft, *Fig.* 2, should always be produced on a lathe of this type.

However, flat time in minutes per piece is an artificial criterion and does not take into account the human fatigue element that is partly a function of the ease of machine handling. The fatigue factor can be taken into consideration by determining the maximum number of pieces that can be produced during an eight-hour period. By re-evaluation of the three machines in terms of daily production, column 2 of TABLE 1, the No. 3 Electro-Cycle shows the greatest and the No. 3 Ram the least.

This would lead to consideration of the Electro-Cycle as the one lathe to use on all workpieces similar to the stud shaft under consideration. However, the health of a business organization is not determined by production figures alone. The overall economy with which production rates are achieved is what counts in the balance sheet.

Table 1—Machine Ranking for Producing a Typical Part

Machine and Horsepower	Flat Time for One Piece (minutes)	Maximum Production in 8 hours (pieces)	Annual Savings Direct Labor (dollars)
#4 (15 hp)	2.96	143	676
#3 (10 hp)	3.18	137	769
#3 Electro (7½ hp)	3.20	147	702

For example, if the effectiveness of the same three machines were expressed in terms of the annual savings in direct labor after full allowance for machine depreciation, the order of choice would apply as shown in column 3 of TABLE 1. The greatest saving would be realized by using the No. 3 Ram.

The total dollars saved is based on a control case: production of 70 pieces per day by a "replaceable" machine in a turret lathe department. With this in mind, the savings in direct labor are computed and the net dollars after depreciation used to determine the new and proper order of choice.

Economical turret lathe production for the part pictured in *Fig.* 1 would be generally between 5 and 10 pieces on the low side and about 300 pieces on the high side. Over 300 pieces per run would be handled most economically by a camless type, multi-spindle automatic. For lot sizes between the maximum and minimum limits, the type of machine chosen is determined by the specific size of the lot so that maximum profit is realized.

It is interesting to note that the machine with the largest motor is the third choice when considered in terms of annual savings in direct labor. The lathe designed for reduced handling is the second choice probably because the size of the run is not compatible with the expense of the lathe. The first choice machine represents a good balance between power and machine handling—a function of proper machine size for the job.

Selection of the proper machine is sensitive to many influences. A proper selection must be based on the previously mentioned factors and such variables as size of lot and length of power cut. In any event, all related and influencing factors must be interpreted in terms of costs and results.

Proper Tooling

As the proper selection of the basic machine influences the degree of efficiency that can be achieved by any production process, so does the specification of the tooling to be used with it. Investigation of tooling, in terms of costs and production achieved, can uncover other areas that have built up as potential profit reservoirs over the years.

The following discussion will show that methods of tooling should be carefully studied even where lot sizes seem to be extremely small. Special tooling can be economically applied to production of small quantities of parts in small lots.

The cast iron flywheel, *Fig.* 3, represents a part that can be made in at least three different ways on a single turret lathe. The correct setup can be determined only by a detailed analysis of the production desired in terms of the economy possible.

The three possible setups are illustrated in *Figs.* 4, 5 and 6. The first is a two-operation method that is simple but not necessarily the most economical. It is used in production organizations where the fear of over-tooling serves to suppress the use of extensive tooling where it should be applied. The second method, also requiring two operations, involves more tooling, higher tooling costs and longer setup time. The third method produces the flywheel in one operation but requires the highest tooling expense and the longest setup time.

The top section of TABLE 2 gives comparable information about the three methods, and the tooling used with each. From Method *A* to Method *C*, tooling costs and setup times increase while flat times per piece produced decrease.

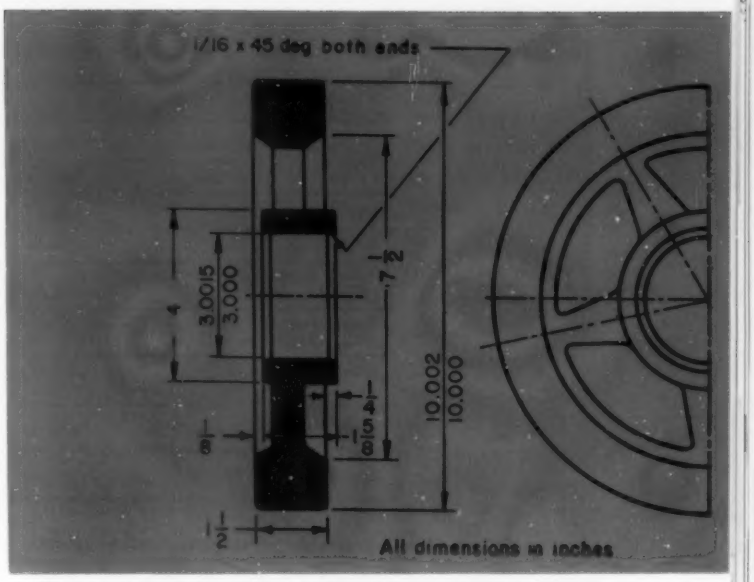


Fig. 3. A cast iron flywheel can be produced by any one of the methods shown in *Figs.* 4 to 6.

It is difficult to visualize a simpler arrangement of tooling for production of the cast iron flywheel than Method *A*, illustrated in *Fig.* 4. Since the setup time and tooling costs are low, this method seems advisable for low or medium lot size production.

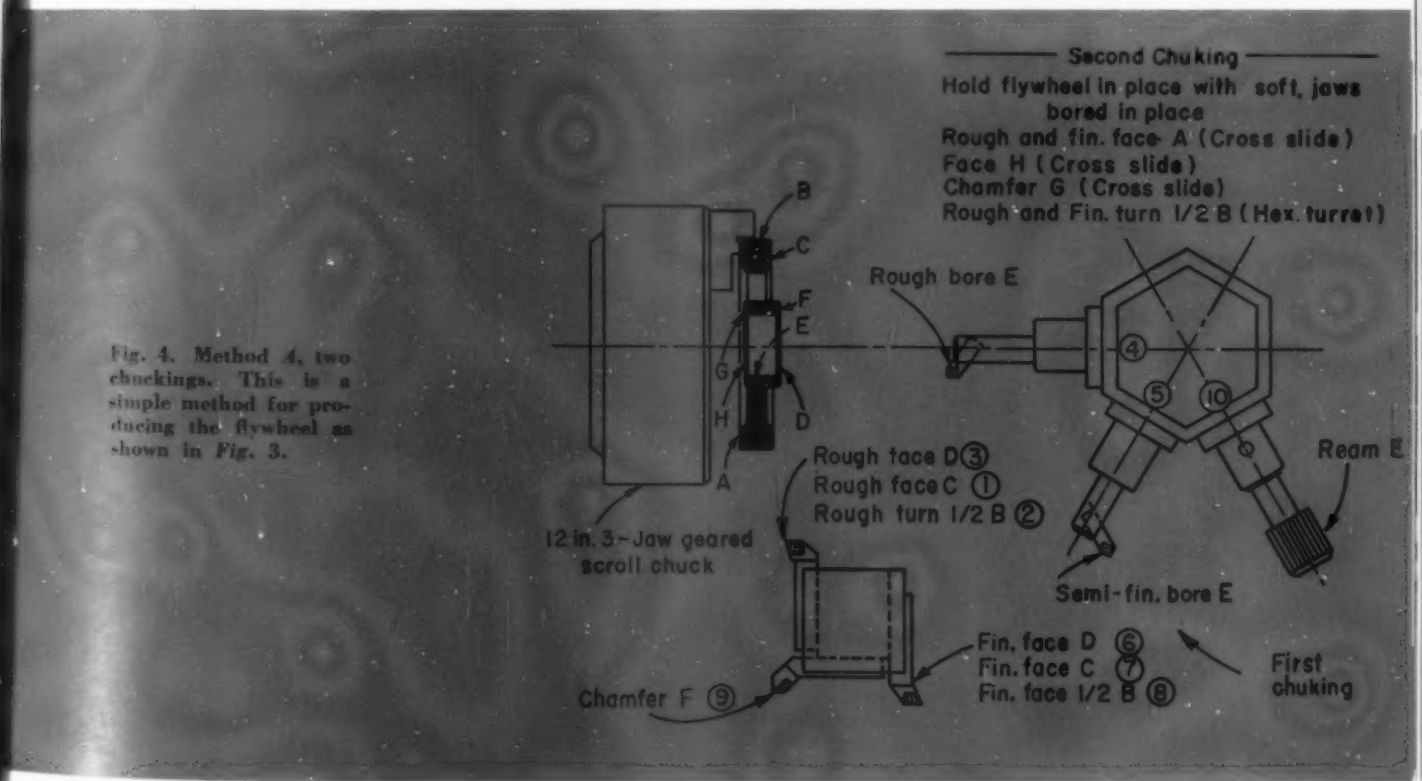


Fig. 4. Method *A*, two chuckings. This is a simple method for producing the flywheel as shown in *Fig.* 3.

Table 2—Comparison of Three Tooling Methods

Method Characteristic			Method *A*	Method *B*	Method *C*
Tooling Costs	Standard	(dollars)	895	1245	2118
	Special	(dollars)	95	233	1568
Flat Time per Piece		(minutes)	13.6	9.0	6.5
Setup Time		(hours)	2.6	3.2	3.4
Hourly Depreciation of Standard Tools (8000-hour write off)		(dollars)	0.11	0.16	0.26
Hourly Overhead Rate (less depreciation)		(dollars)	2.50	2.50	2.50
Hourly Labor Rate		(dollars)	1.65	1.65	1.65
	Total	(dollars)	4.26	4.31	4.41
Production per 48-minute hour		(pieces)	3.5	5.3	7.4
Cost per Piece		(dollars)	1.21	0.81	0.60

Beware of the extreme simplicity of this setup.

Method *B*, *Fig.* 5, requires an additional investment of a few hundred dollars in standard tooling and a slight increase in special tools over Method *A*. The increased tooling expense covers cutters and second-operation chuck jaws. This is the method that should be used for 90 percent of all turret lathe jobs.

The machining method illustrated in *Fig.* 6 is simply an extension of the turret lathe principles brought out by Method *B*. It has some advantages over Method *B* and some additional disadvantages.

Each description of the three methods contains one unqualified statement. To show the basis of each, the three methods will be compared on a monetary basis to indicate when each of the methods would prove superior to the other two possibilities.

The lower portion of TABLE 2 summarizes more facts about the three methods. For the purpose of cost analysis, depreciation is included as a factor in the tooling only; machine depreciation is excluded. The write-off period for standard tools is assumed to be 8,000 hours. Included in the cost per piece is an assumed hourly overhead rate of $2.50 and an hourly labor rate of $1.65, not including fringe benefits.

The individual hourly costs of operation by the three methods are indicated in TABLE 2. These costs apply during setup and down time as well as during actual production. Special tooling costs are not included in this hourly operating cost because the cost of special tooling only enters as a factor to

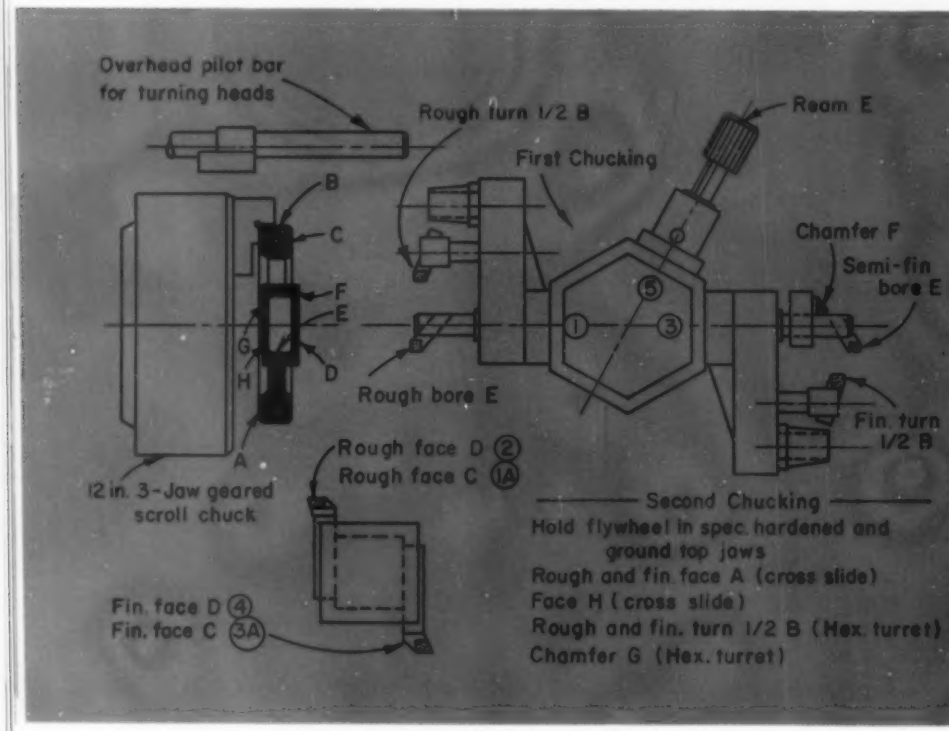


Fig. 5. Method *B*, two chuckings. This tooling should be used for the majority of turret lathe operations.

determine amortization schedules; not to determine the best method.

When information is tabulated as in TABLE 2, it can be studied to determine which method of tooling should be used. Original data can be compiled by actual test for workpieces that each represents a class of possible parts. Future tooling can then be specified from the analysis of the test data.

Since standard tooling is amortized under the hourly cost of operation, it need not be considered separately. Special tooling, however, must be considered in light of the added expense it introduces.

If Method *B* is chosen over Method *A*, the difference in the cost of special tooling is $138. The savings per piece is $0.40. Method *B* would be economically justified for a total production of 345 pieces or more.

Setup times and expenses for the methods influence which should be used for a specific lot size. Setup expense for Method *A* is $11.08; that for Method *B* is $13.79. The difference of $2.71 is slightly more than offset if each production lot comprises seven pieces.

Comparative figures for changing from Method *A* to Method *B*, from Method *A* to Method *C* and from Method *B* to Method *C* are summarized in TABLE 3. The minimum production run figures are break-even points—production that would just offset the increased tooling expense.

The real gain is additional available time for the machine because it would produce the run in less time. If production is larger than for the break-even point, there would be increased profit by changing methods in addition to the increased available machine time. Gains would accrue in two areas. It should be remembered that special tooling costs can be amortized over the total production run and are not influenced by the lot size.

Similar thinking must be applied to lot size. The lot sizes listed in the table are minimum and just cover the extra expense of the setup. Larger lots will show an increase in profits.

In studying TABLE 3, several points should be noticed. The base of comparison must always be considered. This is especially important when comparing Methods *B* and *C*. When compared to Method *A*, Method *C* would require production of 2414 pieces to cover additional tooling expense. But when comparing Method *C* with Method *B*, production of 6357 pieces would be required to justify the change. However, the lot size could be smaller. This is because, when comparing Methods *B* and *C*, the cost of special tooling greatly increases while the setup time is only slightly increased and the amount of savings per piece is diminished. Looked at in another way, this example of tooling approaches the point of no return. For progressively larger increases in tooling costs, the savings per piece are progressively smaller.

Increases in available machine time are shown in TABLE 4 for Methods *B* and *C* over Method *A*. The assumed conditions are: a 250-day year, an 8-hour day, 80 percent of the time available for production (20 percent for personal and machine down time) and a production of 4725 pieces.

To emphasize the idea of small lots and small runs, it is assumed that the machine would have to be set up once each day. Advantages of Methods *B*

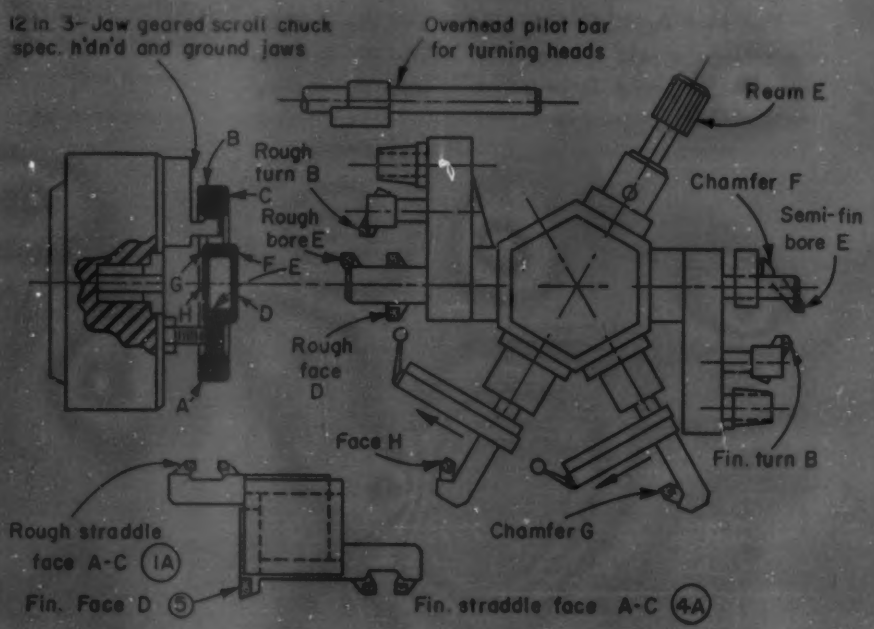


Fig. 6. Method *C*, one chucking. This tooling is an extension and refinement of that used in Method *B*.

Table 3—Production Required to Warrant Changing Tooling Methods

Factor		From *A* to *B*	From *A* to *C*	From *B* to *C*
Increased cost of special tooling	(dollars)	138	1473	1335
Savings per piece produced	(dollars)	0.40	0.61	0.21
Minimum production to amortize special tooling	(pieces)	345	2414	6357
Setup expense difference	(dollars)	2.71	3.91	1.20
Minimium lot size to offset setup difference	(pieces)	7	7	6

and *C* would be even greater if production were considered continuous from day to day. The data in TABLE 3 can also be studied on the basis of much smaller total runs, to introduce the factor of life expectancy of the fly-wheel design. The one factor that has been omitted from TABLE 4 is operator fatigue, which would vary from setup to setup. This factor could be taken into account by determining daily production figures instead of hourly. However, inclusion of this factor would just increase the advantages shown by Methods *B* and *C*, because the addition of tooling reduces operator fatigue.

A properly tooled setup adds machine hours to a turret lathe department without necessitating the addition of extra machines. If the total number of parts required were 6,360—a year's production on a machine set up for Method *B*—and if delivery dates called for this much production in one year, to meet the production by a set up such as Method *A* would require addition of another machine or another shift because it would require just over 336.5 days of Method *A* machine time.

The tool engineer responsible for turret lathe operations should temporarily isolate his favorite concepts of turret lathe practice until the tooling method that produces most profit can be determined. This cannot be done by visual inspection or by instinct. A cost analysis of job groups is necessary; just as necessary as with machine selection.

In general, only the smallest of lot sizes, perhaps 1 to 5 pieces, should be produced according to Method A, a method that includes short set up time and low tool costs. Comprehensive standard tooling should be used on lot sizes ranging from approximately 5 pieces upward. Simple special tools, such as: cross slide cutter blocks, chuck jaws, boring bars, etc., more than repay their cost in over-all savings and should be applied without hesitation to moderate size lots.

Work types and the flow of work through a turret lathe department should be analyzed to determine individual tooling methods according to classes of work. If the types of jobs produced are uniform, then a uniform tooling method may be used, otherwise company profits can only begin with the specialization of the tooling approach.

When analysis by machine and by tooling set up is earnestly done, maximum production can be obtained from existing equipment before purchase of additional machines need be considered. Rules of thumb are reintroduced by analyzing representative workpieces and applying the results to groups of parts, but they rest on a firm foundation.

Table 4—Comparisons of Assumed Production

Factor		Method *A*	Method *B*	Method *C*
Setup time	(hours)	2.6	3.2	3.4
Available production time per day	(hours)	5.4	4.8	4.6
Production per 48-minute hour	(pieces)	3.5	5.3	7.4
Production per 8-hour day	(pieces)	18.9	25.44	34.0
Production per 250-day year	(pieces)	4725	6360	8500
Time required to produce 4725 pieces	(days)	250	186	139
Available machine time after production 4725 pieces	(days)	0	64	111

Note: Assume 1 setup per day.

SELF-CENTERING VISE automates simple processes

By F. G. Gepfert

President, Black Drill Co., Inc.
Cleveland, Ohio

ORIGINALLY DESIGNED for centering different sizes of round and hexagonal bar stock, this self-centering vise has received acceptance by industry as a locating means for centering, end milling and other operations where the work to be performed bears a definite relation to the axis of the piece. Such vises are presently in operation on milling machines where equal amounts are to be milled from both sides of forgings that may differ in size by as much as $\frac{1}{8}$-inch. Rods, varying $\frac{3}{16}$-inch in diameter, are hollow-milled so that the milled part and the rough part have the same axis. By changing the location of the jaws, construction holes are put in castings so the distances of the holes from the end remain constant regardless of variations in the casting length and diameter dimensions.

A precision tool, this vise can be used to locate centers or other predetermined points regardless of shape or nonuniform sizes of parts. In operation, the jaw tolerance from any established point is ± 0.001 inch at any jaw opening within the working range of 0 to 4 inches. Opening width of jaws is controlled by an adjustable lock collar.

Jaws are independently adjustable from the centerline to accommodate workpieces that are not symmetrical. False jaws can be fitted to the master jaws so that the vise will correctly position any shape of part.

The vise comprises a cast iron base with two opposed, double-acting air cylinders, *Fig.* 1. A mas-

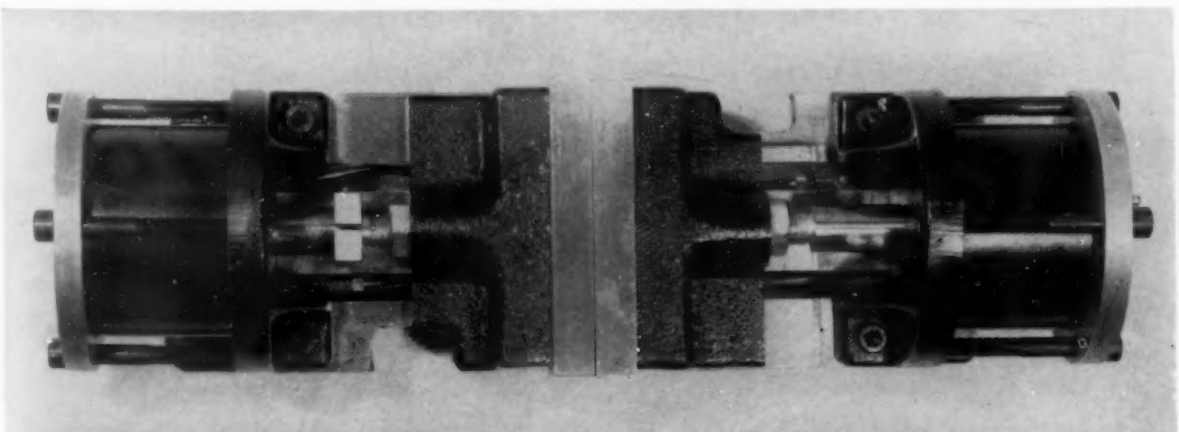
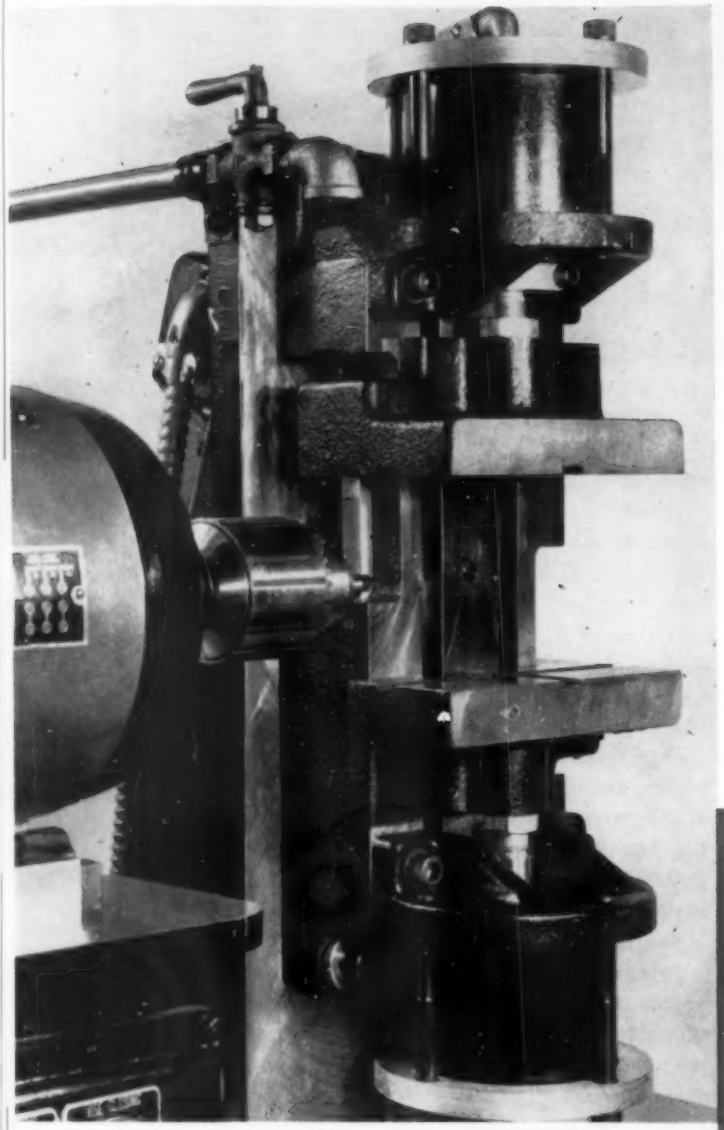


Fig. 1. Self-centering vises such as this can be built into a variety of equipment to provide a positive method of part location. The jaws are rigidly attached to the operating air cylinders and their movements are synchronized with high accuracy.



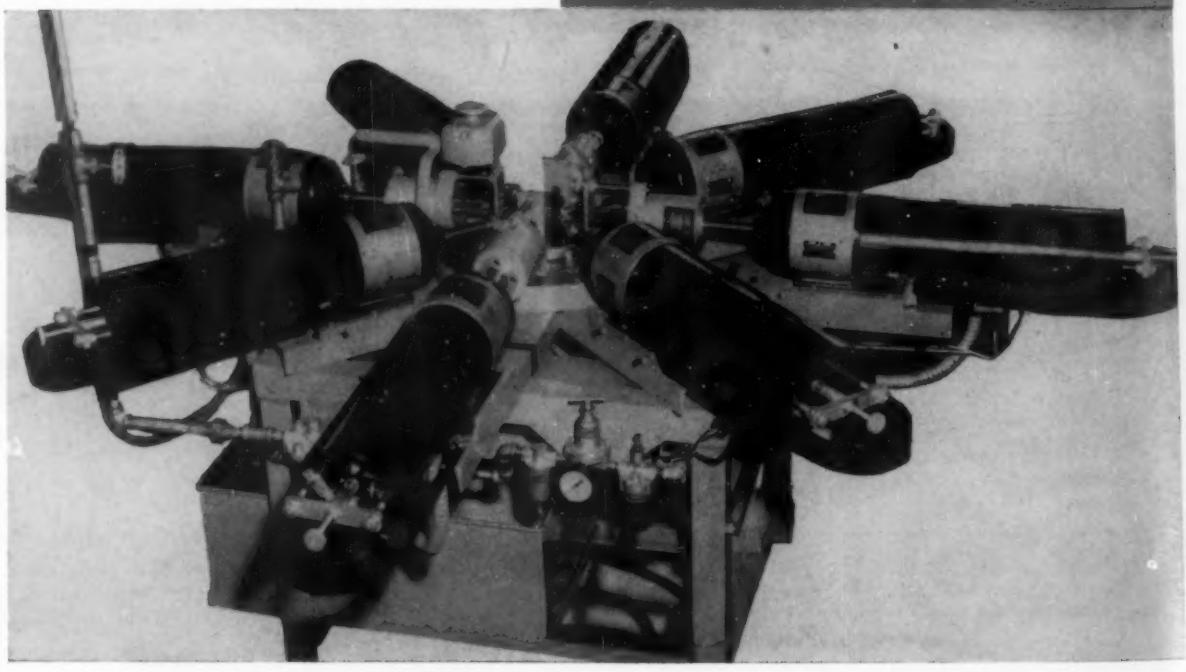
ter jaw is directly connected to the end of each of the piston rods. Master jaws travel on guides and the movements of both jaws are synchronized by mechanical means located in the base. No forces are transmitted through the synchronizing mechanism, since the design of the vise is such that all force is in a straight line from the air cylinders to the master jaws. Sole purpose of the synchronizing mechanism is to produce uniform jaw travel over the full range of movement.

Each piston has an area of 9.62 sq in. and is used with shop air from 5 to 100 psi. By adjusting the air supply pressure, clamping forces up to 2,000 lb can be obtained. The complete vise occupies less than 2 sq ft of bench space and is held in position by four bolts. Air line connection to a four way valve places it in operation.

Air-foil blades for jet compressors are centered by the machine shown in *Fig.* 2. It is necessary to center the air-foil forgings so they can be mounted in a profile grinder. The basic problem in this otherwise simple operation is lack of uniformity in the dimensions of the forged parts. An in-line drilling unit was selected as the drilling member and a

Fig. 2. (top left) Mounted vertically, this self-centering vise is used to position forgings for jet compressor blades so they can be accurately centered prior to mounting on a profile grinder.

Fig. 3. (below) Eight in-line drill units operate on a mortar shell fin that is positioned by a self-centering vise hidden under the working surface.



self-centering vise was used as a locator and work holder. The vise is equipped with special jaws to accommodate the dimensions of the blades at different stages of production.

A root locator was incorporated in the design of the forging and it is used to determine the depth of the center hole. The tong hold is the centered member. The vise is controlled by a commercial four-way double-acting solenoid air valve.

In operation, the piece is placed in the vise jaws and the operation is cycled by actuating a push button. At the start of the cycle, the solenoid air valve operates to close the vise jaws. Through a standard microswitch, the closed vise jaws energize the solenoid of the air valve on the drill unit. The drill has a rapid advance to the work and a slow feed rate. The combination drill and countersink then forms the center hole.

Since it is desirable to use fixed centers on the grinder, without adjusting for variations of length in the blade forging, center holes are drilled deeper in long parts than in short ones. The root locator acts as an automatic guide to drill the center hole to the correct depth.

With the hole drilled to the correct depth, the drilling unit automatically retracts and a microswitch energizes the other side of the vise air valve solenoid to open the vise. Operating time from placement of part to its removal is about ten seconds.

Another manufacturing application of the self-centering vise involves drilling cotter pin holes the same distance from the ends of pieces of random lengths with diameters ranging from $\frac{1}{4}$ to 1 inch in increments of $\frac{1}{64}$ inch. The parts are made in quantities of 100 to 5,000 from round or hexagonal stock.

Set up for this operation involved the use of false jaws in the vise, so arranged that a flat surface of the hexagonal stocks is presented to the in-line drilling unit. The base of the vise was drilled to accept the plunger of a microswitch. Insertion of any size of round or hexagonal stock energizes the air valve of the vise. When the vise is closed, the drilling unit is actuated, the hole is completed and the vise opens. With this machine 85 different sizes and shapes are processed with no change in the equipment.

As illustrated in *Figs.* 3 and 4, production of mortar shell fins involved the design of an entirely different machine. Eight separate drilling units are arranged radially around the projecting end of the fin. Each drill unit has a built-in template to start the hole exactly where wanted on the cylindrical surface. The fin is positioned by a self-centering vise, side-mounted under the surface of the machine. The V-jaws of the vise position the part and when they are clamped start the drilling cycle.

In many plants, the magnitude of production or the frequency of design changes prohibit the complete automation of production. However, individual production processes, or even portions of processes, can frequently be profitably retooled in accordance with the basic principles of automation.

The machines described were all constructed from commercially available parts and indicate the extent to which automation can be carried out process-by-process. Self-centering vises, air-controlled drilling units, solenoid air valves and standard microswitches can be combined to increase quality of product and reduce setup time.

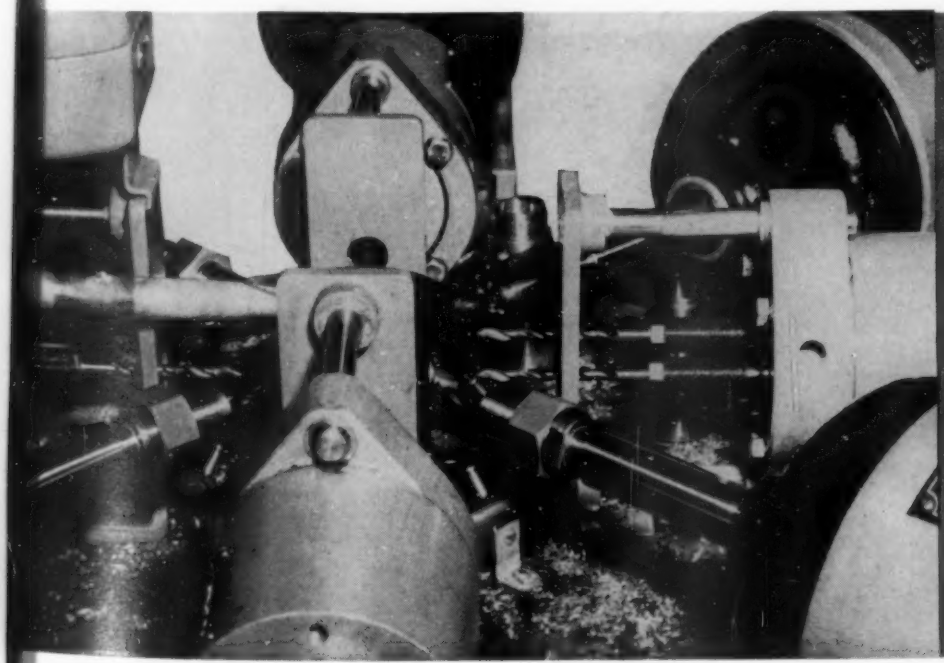
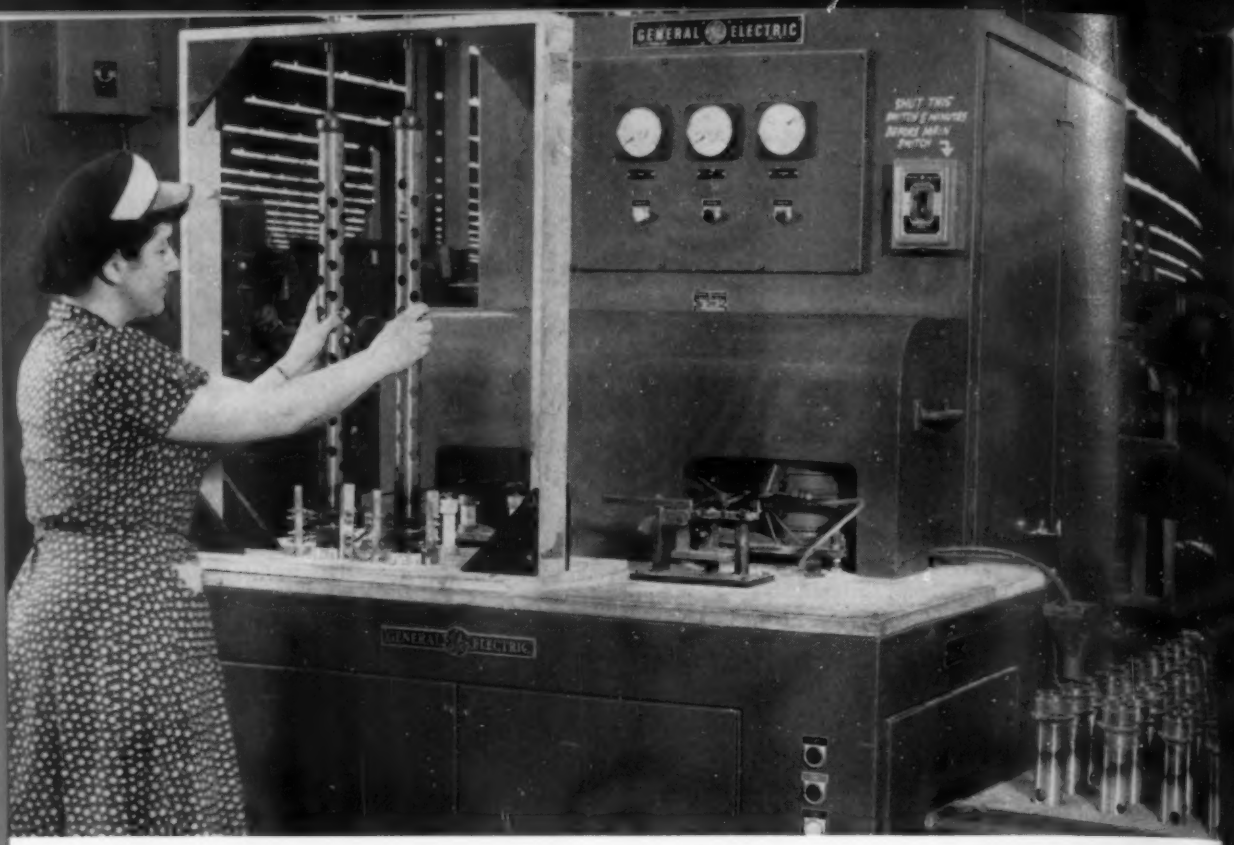


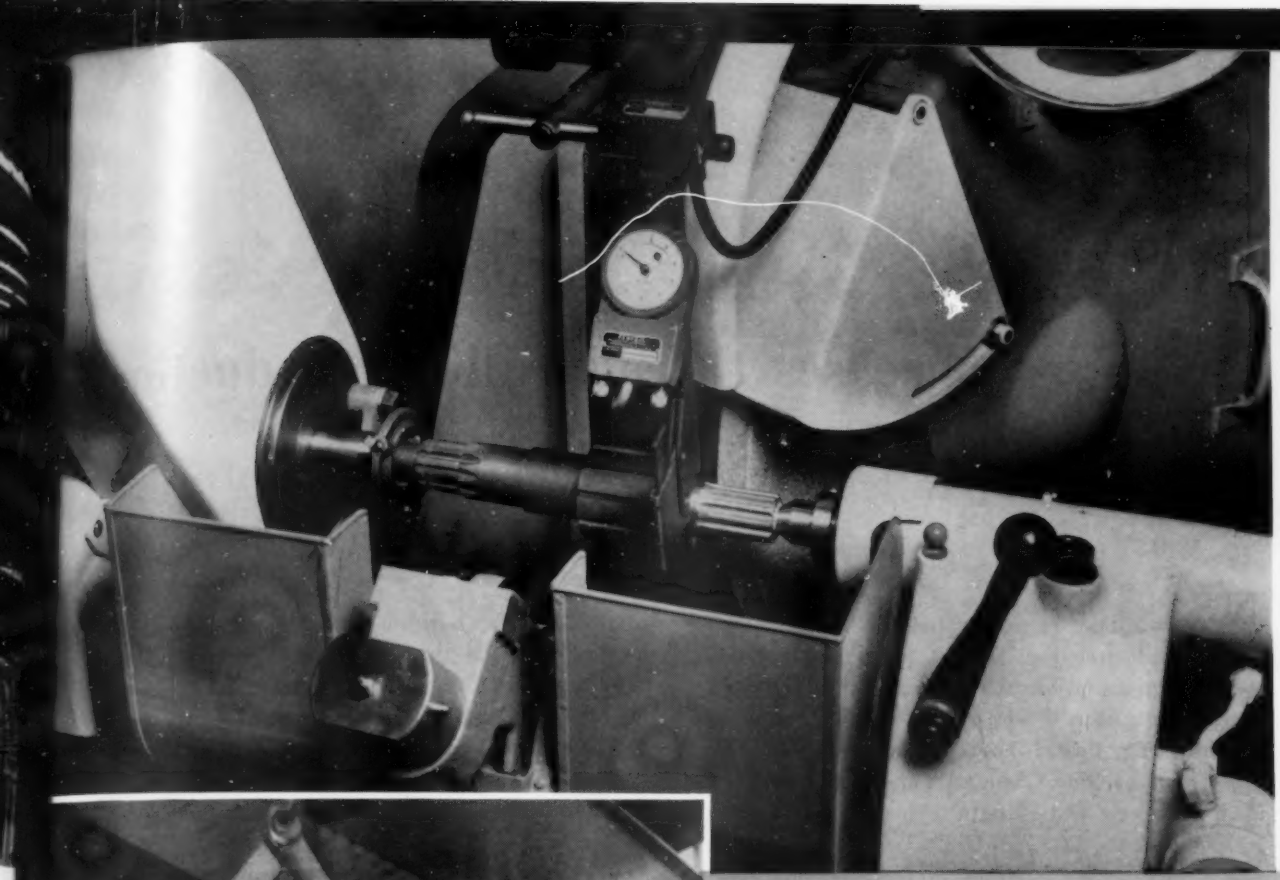
Fig. 4. Close-up of the working area of the mortar shell fin drilling machine illustrated in *Fig.* 3.



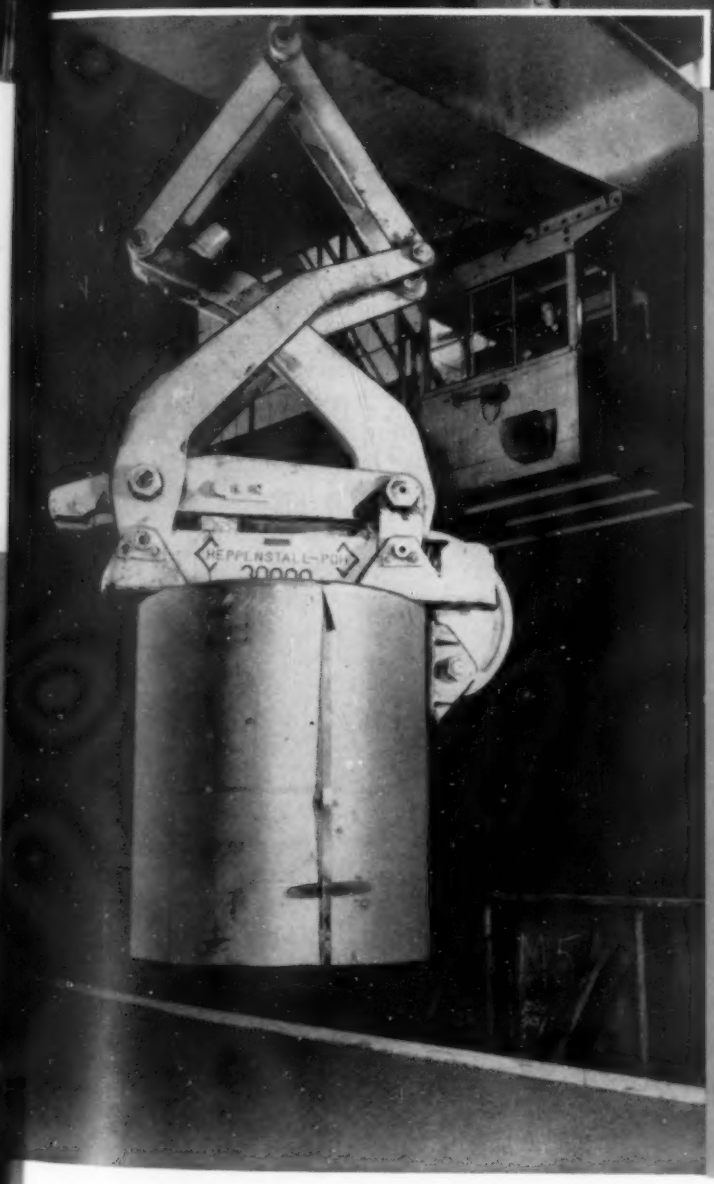
TOOLS at work

PRODUCTION OF ORDNANCE PARTS was streamlined at a New England plant by means of these GE 20-kw induction heaters which are shown brazing together parts of the machine gun cooling jackets. Introduction of this semi-automatic process in place of a hand operation resulted in a faster, cleaner assembly. A more uniform joint is secured with better penetration of solder and a saving in materials. In addition inspection time was reduced. A relatively unskilled operator is now used on the job.

FINISHING MACHINING OPERATION on servomechanism valve for a guided missile is being performed at Bell Aircraft Corp. on a Levin jeweler's lathe. Tolerances on such parts are specified at from 0.0001 to 0.0002 inch. The sensitivity of the miniature lathes and fine finish produced was found to be most suitable for this type of work.



AUTOMATIC PRODUCTION GRINDING operation is controlled by an electromechanical gaging unit which regulates the machine so as to produce nothing but acceptable pieces. The Federal gage unit is mounted so that the workpiece is measured by contact surfaces and the size information is transmitted to the machine controls as well as appearing on the dial indicator. Actual control is by two limit switches operated by the indicator spindle.



GRIPPED BETWEEN the outside shoe, visible at right, and the inside shoe (unseen) automatic tongs developed by Heppenstall Co. lifts a 15-ton coil of sheet steel for loading at Pittsburgh Steel Company's new semi-continuous mill for hot rolled sheet a Allenport, Pa. The tongs are designed so the weight of the coil causes them to hold with an unyielding grip. Once the coil is delivered, an automatic mechanism locks the jaws open so the tongs are ready to pick up another coil. The tongs will not malform the coils nor mar the edges of the sheet steel. All operations are controlled by the craneman eliminating the need for a ground crew.

Rotary Die

increases thread rolling production

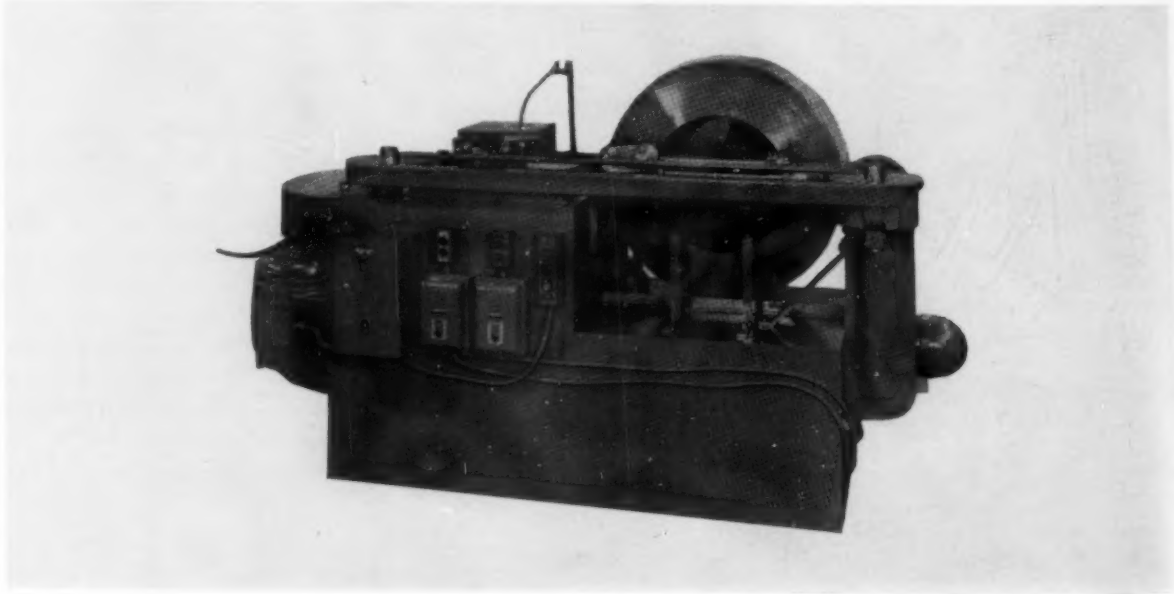
NOVEL TOOLING in the hopper-fed thread rolling machine illustrated at bottom has made possible the continuous production of screws at rates ten times greater than those possible with conventional reciprocating thread rolling machines. In this prototype machine, designed and built by The National Screw and Manufacturing Co., the thread rolling dies consist of a circular ring rotary die and a segment of a circular ring stationary die.

Because there are no reciprocating parts in the rolling mechanism and dies, the operating parts are extremely simple and can be run at relatively high speed. Blanks are fed in a continuous stream with minimum spacing between them as they enter the dies instead of feeding one blank each cycle into reciprocating straight die sets for thread rolling. As many as ten or twelve screws may be between the dies at one time in this unusual machine.

Design of the dies involved intricate calculations as well as considerable research and experimentation to assure accurate rolling. The rotating die, having a constant radius, has uniform threads. The stationary die, however, has a decreasing inside radius with the thread forms so calculated that they will match the rolling operation of the rotary die offset a distance equal to the turn of the blank through 180 degrees.

This automatic machine is operated by pouring blanks into the revolving drum type hopper. Vanes in the hopper lift the blanks into a wide delivery chute from which the blanks drop between two revolving rolls. The excess blanks spill over the rolls and fall back into the hopper. At the end of the rolls is a clearing wheel mechanism which kicks out improperly positioned blanks. Blanks, properly positioned, are conveyed to a feed-in wheel which delivers blanks at spaced intervals between the rotary and stationary die set.

Seven machines have been in successful operation for more than a year and one set of dies has made over six million screws. This machine is capable of rolling thread on screws at a rate of 500 to 2500 per minute in sizes ranging from 3/16 to 5/16-inch diam in lengths from 1/4 to 2 inches.



Gaging Cams Optically

saves time and money

INSPECTION OF IRREGULAR CAM CONTOURS has been a difficult and time-consuming job in the past. Now a method of checking such parts quickly and accurately has been developed by Optical Gaging Products, Inc., 26 Forbes Street, Rochester 11, New York. The optical gaging method permits inspection of cams mounted as they will be held in assembly. Inspection of the entire contour is effected with the intense light of a surface illuminator of a contour projector which permits viewing the magnification of indicator ball and tolerance lines on the screen, *Fig.* 1.

The cam to be checked is mounted on the arbor of the staging fixture, *Figs.* 2 and 3. The staging fixture is simple in appearance and in operation. An adjustable Y-type yoke carries two followers. One is a precision hardened steel ball which is spring loaded to follow the contour of the cam itself. The other is a flattened circulator indicator. This faithfully duplicates the motion of the follower riding on the cam contour. The axis of the arbor on which the cam to be checked is mounted is common with that of a glass reticle. The cam is on the operator's end of the axis. The motion of the reticle throughout inspection procedure is identical with the motion of the cam, *Fig.* 3. The reticle is a precise actual size glass reproduction of the contour and tolerance lines, as specified on the cam drawing. The reticle may be quickly replaced. Tolerance and contour revision may be incorporated in replacement reticles.

As noted, the light source is a surface illuminator located on the optical axis, within the cabinet of the projector.

Incorporated in the staging fixture, on the operator's side of the reticle, is a mirror facing the contour projector, *Fig.* 3. The light from the surface

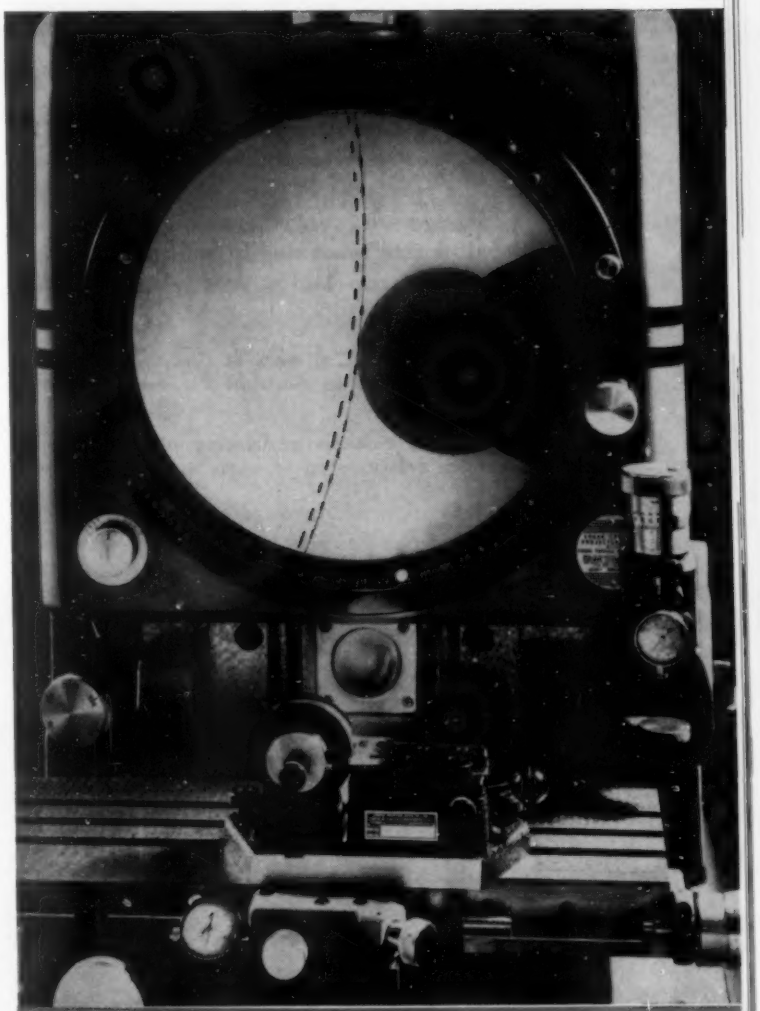


Fig. 1. Image of the indicator ball falling within projected tolerance lines immediately proves this dimension of the cam is satisfactory.

illuminator passes through the glass reticle to this mirror. The light is then reflected back through the glass, past the black tolerance lines of the reticle, into the projector's optical system and so on to the viewing screen. The images of the tolerance lines and indicator ball are thus projected onto the screen, at any selected magnification, usually 34¼ or 50.

Initially, the cam and the reticle are brought into complete coordination as far as angular and radial location of a starting check point is concerned. This is accomplished by making adjustments so that the image of the indicator ball is tangent with the image of a set line when the set master provides a V-notch for positive location of a cam follower ball at an initial reference point specified on the part drawing. Adjustments are provided to lock the setup securely in position. The set master cam is then replaced with an actual cam, and the checking procedure may proceed for all points around the periphery of the cam. The spring-loaded follower ball traces the contour of the cam, and the indicator ball on the reticle side will accurately follow its position in relation to the master reticle being projected on the screen. *Fig.* 1 shows the tolerance and cam contour lines and the indicator ball shadow on the screen of the contour projector.

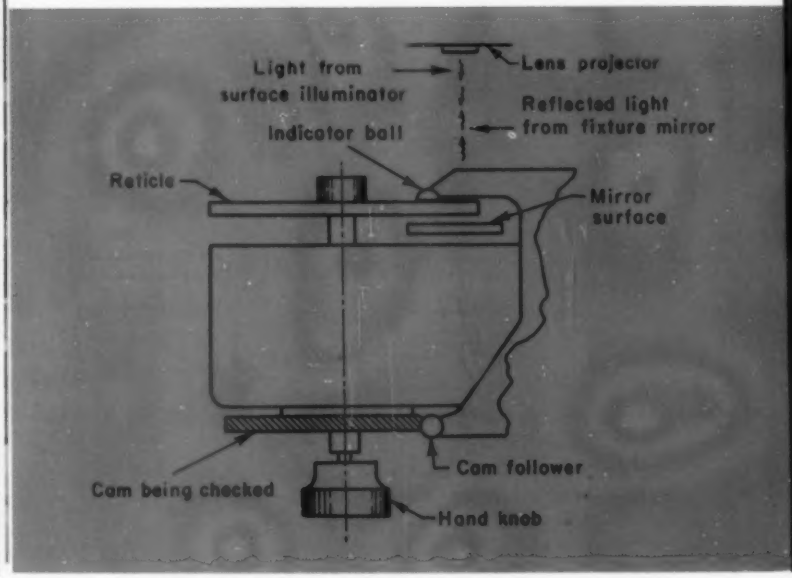
Often the tolerances of cam contours are called out at only specified angular intervals, for instance at one-half-degree intervals. In addition, the total tolerance for any one check point may vary from the total tolerance of another check point. These variations in tolerance along the contour of the cam are accurately reproduced on the reticle glass. The cam contour is drawn through all the variable tolerances at all locations. So, actually, every point along the contour gets an immediate visual check. Thus, not 720 points, at one-half-degree intervals along the contour, but an infinite number of points are checked. Any pits, blemishes, tool marks, and scratches of any nature, which may throw intermediate points out of tolerance are indicated positively on the viewing screen.

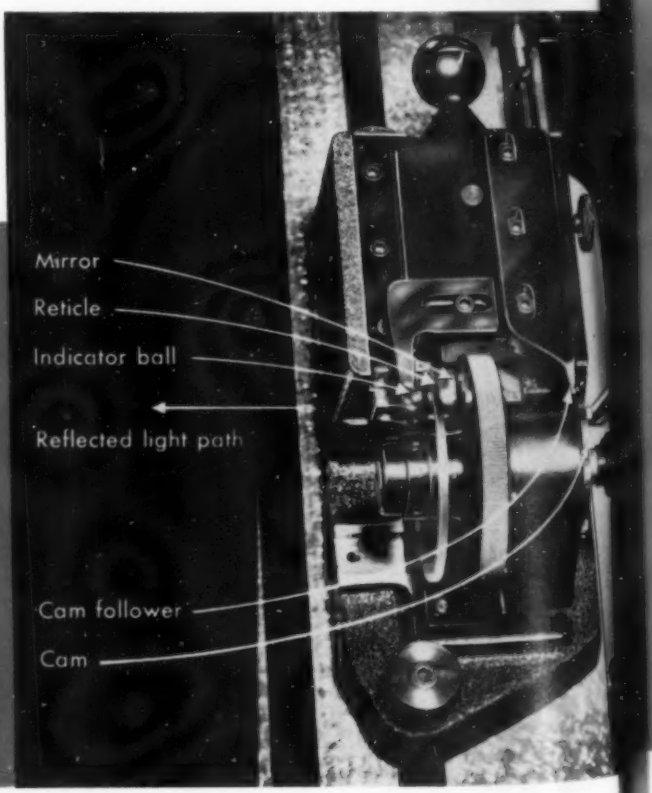
Previously, inspection of cams, with tolerances as close as .0005 inch, required 13 hours per cam for inspection by an experienced inspector. The optical gaging method reduces this to inspection of the entire contour within 40 seconds. Even an inexperienced operator can perform the actual visual inspection once the job has been set up, as all that is required is to replace cams on the arbor and to match the indicator with tolerance lines on the screen.

With the optical gaging method there is no wear problem, nor are there any difficult adjustments to make. Vulnerability to handling is eliminated; simplicity assures reliability. Since it can be rapidly set up for a large variety of shapes and sizes of cams, the new method offers real cost reduction for a particular problem and the principles are applicable to similar problems arising on production lines and in machine shops.

Fig. 2. (below right) Top view of the staging fixture with cam and reticle in position for inspection.

Fig. 3. (below) Schematic drawing of fixture, top view, showing relationship of parts and light source.





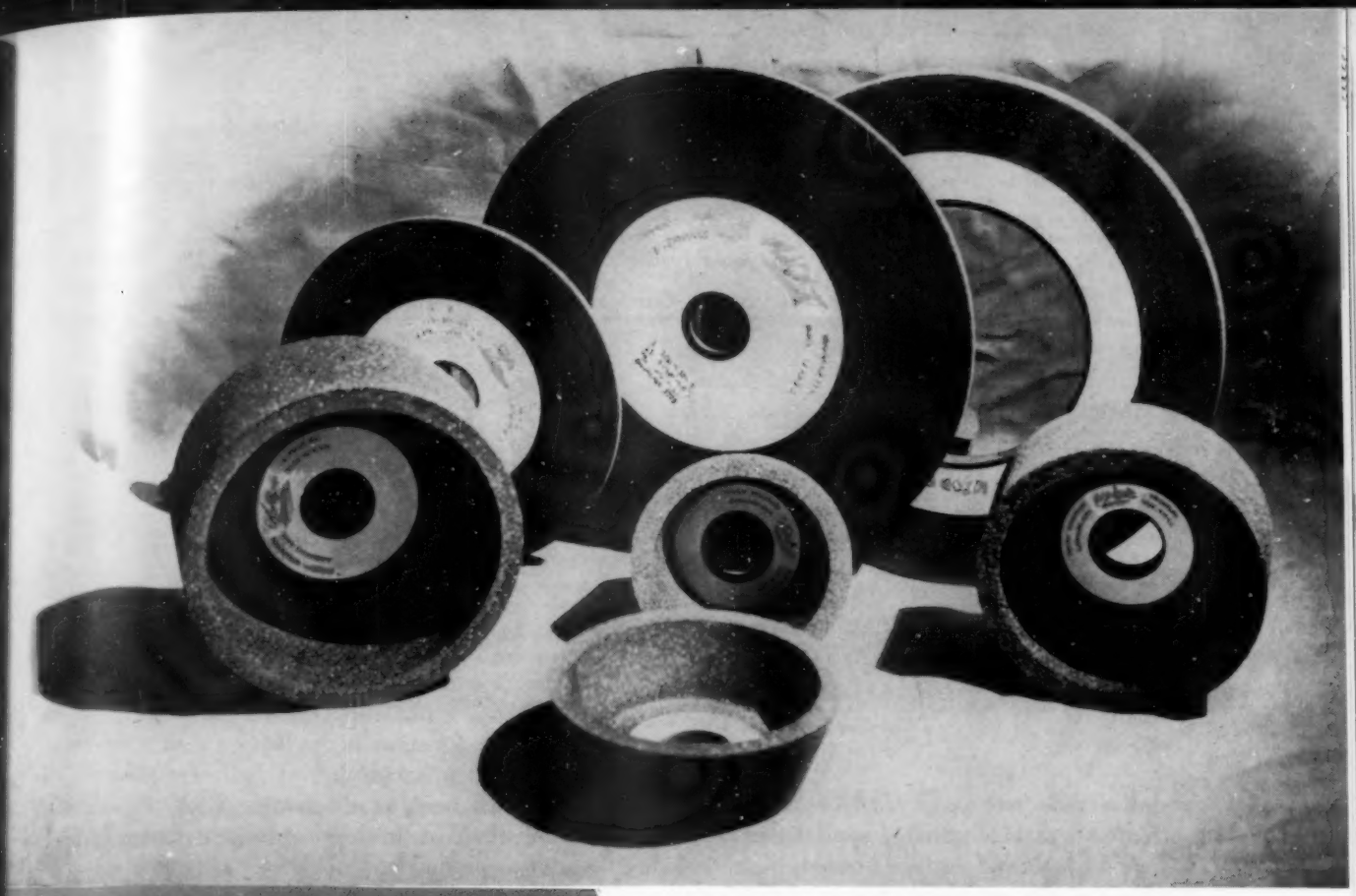


Fig. 1. This selection of resin-bonded silicon carbide grinding wheels indicates the variety of shapes and sizes available. Not recognizable in a photograph are the different grades available for grinding different grades of cemented carbide tools.

Carbide Tool Grinding with Resin Bonded Wheels

By N. P. Roble
Asst. Dir. of Research
and
A. D. Stover*
Abrasive Engineer
Electro Refractories & Abrasives Corp.
Buffalo, New York

FOR MANY YEARS INDUSTRY has looked for a grinding method by which worn and chipped cemented carbide tools could be sharpened and reconditioned more efficiently and economically. Such a method is now available with the refinement of resin-bonded silicon carbide grinding wheels. Former resin-bonded wheels were either too hard, cracking the carbide, or so soft they threw grit and had short service lives.

Several years ago an extensive research program was launched with the express purpose of developing a suitable resin-bonded wheel for grinding cemented carbide tools and determining techniques for using such wheels. The high cost and limited supply of diamond wheels spurred this development since it was felt diamond-wheel use could be decreased with the development of a good resin-bonded wheel.

The new wheels are capable of removing up to 0.025 inch per pass on many applications. In addition, the resin-bonded wheel results in a fine finish

*Senior member ASTE Detroit chapter

Table 1—Comparison of Costs Between Single Resin-Bonded Wheel and Former Two-Wheel Method

	Resin Bonded SiC (Shank & Carbide)	Vit. Bonded Al_2O_3 (Shank steel) &	Vit. Bonded SiC (Carbide)
Wheels used, number	1	1	1
Cutters ground, number	6	6	3
List whl. cost, dollars	3.45	3.80	3.80
Net whl. cost, dollars	1.97(-4-35%)	1.44(-31-45%)	1.84(-12-45%)
Whl. cost per cutter, dollar	0.33	0.24	0.61
Time per cutter, minutes	4.75	6(incldg. 1-min. whl. change)	
Labor, cost per min., dollar	0.06	0.06	
Labor, cost per cutter, dollar	0.285	0.36	
Wheel cost per cutter, dollar	0.330	0.85	
Total cost per cutter, dollar	0.615	1.21	

and diamond-wheel usage can be reduced.

There are carbide grinding applications on which diamond wheels and vitrified bonded-silicon carbide wheels are still preferred, but in many instances resin-bonded silicon carbide wheels are best. The number of applications for the new wheel is rapidly expanding.

Green silicon carbide is used extensively in carbide wheels because many users have felt it is somewhat more friable and thus cooler cutting than black. With the vitrified bond, the pleasing green color has been a factor in its selection, and no data is available to definitely indicate how much of the preference for green silicon carbide wheels is psychological. Extensive tests on resin-bonded wheels of both colors have indicated they do about the same jobs in about the same manner. There is no definite dividing line between the types of jobs on which each should be used.

Grit sizes used for resin-bonded silicon carbide wheels range between 46 and 120. It is most important that a special resinoid bond be used to produce a wheel having cool cutting characteristics as well as sufficient durability. Overheating the work leads to cracking the cemented carbide tool.

New Grinding Techniques

Introduction of the resin-bonded silicon carbide wheel for cemented carbide tool grinding has brought new techniques to the art of cutter-grinding. It was formerly common practice to regrind a carbide milling cutter in three stages. The soft steel shank was first backed off with a vitrified aluminum oxide wheel. Then the carbide would be backed off with a vitrified silicon carbide wheel leaving about 0.015-inch land on the cutting edge. Finally the cutter would be finish-ground with a diamond wheel prior to production.

These three steps required considerable time because no more than 0.002 to 0.003 inch could be removed per blade per pass, and because the method required several wheel changes. The low material removal rate was necessary even when backing off the shank because if too much heat was generated during that process it could crack the carbide.

With the new resin-bonded silicon carbide wheels, it is possible to back off the shank steel and carbide tip simultaneously at rates up to 0.025 inch per pass without danger of cracking the carbide. For some applications no further grinding is required, which saves the time formerly expended in changing wheels. Since costs of materials and labor are both steadily rising, these are desirable advantages.

A Detroit tool manufacturer has found that through proper use of the new wheels, efficiencies in processing various types of cutting tools result in savings of more than 25 percent. In some cases, the savings are as much as 50 percent. The two major factors that brought about the improved efficiency are reduced diamond wheel useage and a drastic reduction in finishing time per tool. It has been found that wheel life increases by as much as 300 percent when compared with former wheels used.

The data in TABLE 1 illustrates some of the economies resulting from the use of resin-bonded silicon carbide wheels as compared with the use of a combination of vitrified aluminum oxide and vitrified silicon carbide wheels.

There are several basic principles that must be understood to successfully use the new wheels. The natural breakdown of the materials plus the resilient

nature of the bond permit greater infeeds. But because of these same factors, a slight crown may be encountered on large diameter cutters with large blades where the wheel is required to grind a large area of carbide. To overcome this it is sometimes necessary to finish such cutters with a light pass of a diamond wheel.

Generally speaking, the new wheels are used mainly for roughing operations, although heavy roughing cuts and light finishing passes can be taken with the same wheel. A 60-grit resin-bonded wheel produces a better finish than a 100-grit vitrified wheel. A 120-grit resin-bonded wheel results in a superfinish. Grit size, hardness and wear rate can be combined in a series of wheels to cover any range of requirements. Wheel sizes and configurations, as in *Fig.* 1, vary widely.

There are some specific applications on which resin-bonded wheels produce as fine a finish as diamond wheels. These applications are those that require only a small arc of contact between the tool and the wheel. A few examples of this are single-point tools where a radius is ground on the point, spot-facing reamers and reamers on which the outside diameter is ground.

Part of the technique for successful operation of resin-bonded wheels is to avoid repeated passes over the same area. This can lead to over-heating. Present recommendations indicate that circling a cutter is the best method. One heavy cut and return is taken on each blade and then the machine is indexed to the next blade.

Because of its different characteristics, care should be exercised in introducing this wheel into use. It may be necessary to modify standard wheel specifications slightly to comply with the particular grades of carbides being ground. The tool maintenance policies also have an effect on the types of resin-bonded wheels chosen. Some companies recondition badly worn cutters while others have a tool control program that prevents deterioration of the tools before they are reconditioned. The latter tools require less grinding, and for greatest efficiency different grade wheels would be used by the second company than the first.

A harder wheel is required where excessively worn or chipped cutter blades are conditioned, and a softer wheel where cutter blades are reconditioned more frequently and where finer finish with lighter cuts is stressed.

Typical Applications

Typical of the applications, *Fig.* 2, of the new wheels are the Oliver Ace grinder and the Cincinnati No. 2 Cutter Grinder using Type 11 cup wheels 4/3 x 2 x 1¼ inches and 5/3-¾ x 1¾ x 1¼ inches. Also, these machines use Type 6 straight cup wheels in various sizes.

The Ingersoll Tub grinder is another machine on

Fig. 2. Carbide blades inserted in a cutter can easily be ground with a resin-bonded silicon carbide cup wheel. Note how the projecting shank and carbide are supported during grinding.

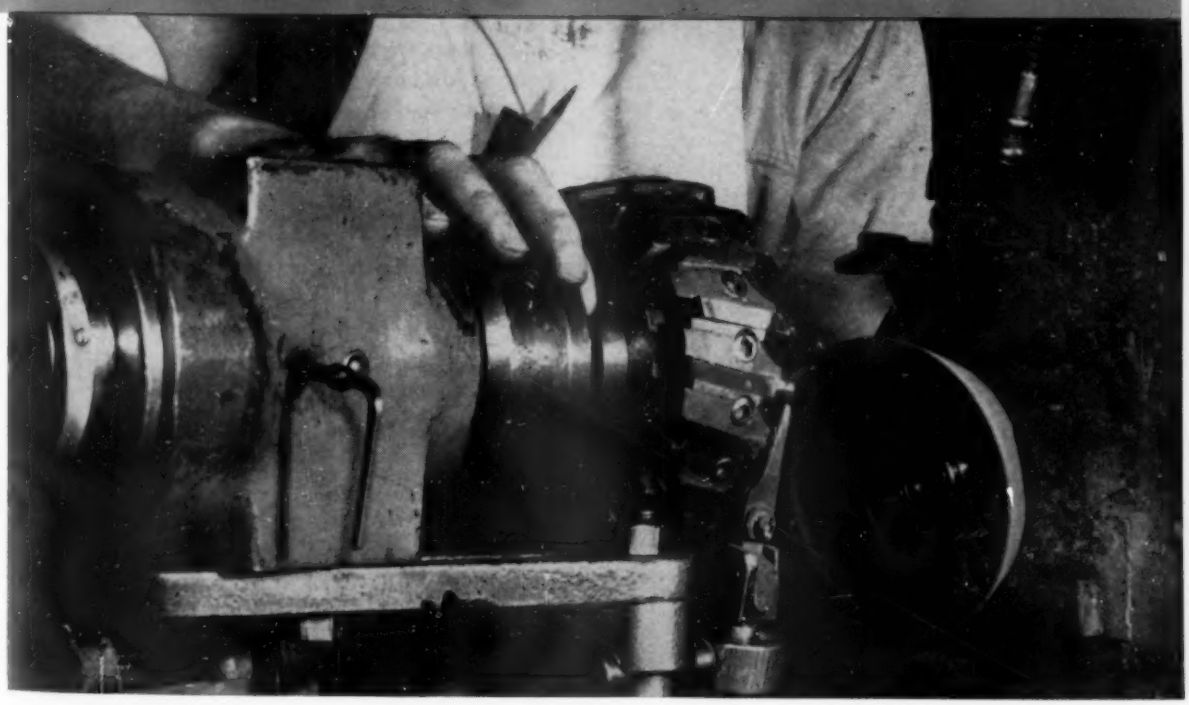


Table 2—Costs for Resin-Bonded Wheels vs. Diamond Wheel on Tub Grinder

	Resin Bonded SiC Wheel	Diamond Wheel
Wheels used, number	6.19	1
Blades ground, number	7,474	30,000
Blades ground per wheel, number	1,205	30,000
Wheel cost, dollars	2.55	364.00
Wheel cost per blade ground, dollar	0.0021	0.0122
Labor cost per minute, dollar	0.06	0.06
Average time to grind blade, dollar	0.176	0.124
Labor cost per blade, dollar	0.0105	0.00744
Total cost per blade, dollar	0.0126	0.01964

which the resin-bonded silicon carbide wheel is being used successfully. Introduction of resin-bonded wheels on this application requires special attention to condition the operators to the different techniques required with the new wheels as against methods used with diamond wheels. Diamond-wheel methods with resin-bonded wheels will not keep the cutters within runout tolerances.

Correct procedure with the resin-bonded wheel requires that the circular cutter be divided into quarters, or at least halves, with each area being worked separately. This is necessary because of the greater wear of the resin-bonded wheels. Operators test for high blades and runout by "sparking" with the diamond wheel, but because of the resilient bond of the new wheels they can be made to spark even if the blades are within runout tolerances.

As operators grow more accustomed to the new type of wheel, efficiencies increase. On the Ingersoll grinder, both roughing and finishing cutters are ground with a 10 x 3/8 x 1-inch wheel. Operations are also being successfully done with a 10 x 1/4 x 1-inch wheel. No further grinding is necessary on roughing cutters.

However, it has been found in the automotive industry, where the requirements on finishing cutters frequently demand runout be held within 0.003 inch, that a finish grind is necessary. The resin-bonded wheel is used for roughing cuts to give a 0.015-inch land and then the cutting edge is finished with a diamond wheel. This reduces use of diamond wheels to a minimum.

The information in TABLE 2 illustrates the economies that can result with the use of resin-bonded wheels over diamond wheels where finish grinding is not necessary. The tools ground in the tests were roughing cutters used in a large cast engine plant.

Another application of the new wheels is in face-mill grinding on the Oliver Automatic Face Mill grinder, as in *Fig.* 3. The new wheel has proved more economical than the vitrified bonded silicon carbide wheel using either manual or automatic feed. Wheels generally used are 10 x 1/2 x 5 inches.

Here again the correct resin-bonded wheel has given lower cost, finer finish, fewer chipped blades and less wear on the diamond dresser. Substantial reductions in wheel cost per cutter ground have accompanied longer cutter production life between sharpenings because of the finer finish produced by the resin-bonded compared to the vitrified wheel.

Representative of other successful applications of resin-bonded silicon carbide wheels are: outside diameter grinding tipped reamers and drills, flat broaches with carbide tips and radii grinding on sidemill cutters. These operations were all formerly done with diamond wheels. Even greater application of the new wheels is anticipated from a program of cooperative research covering new wheel formulations and their practical application under production conditions in industry.

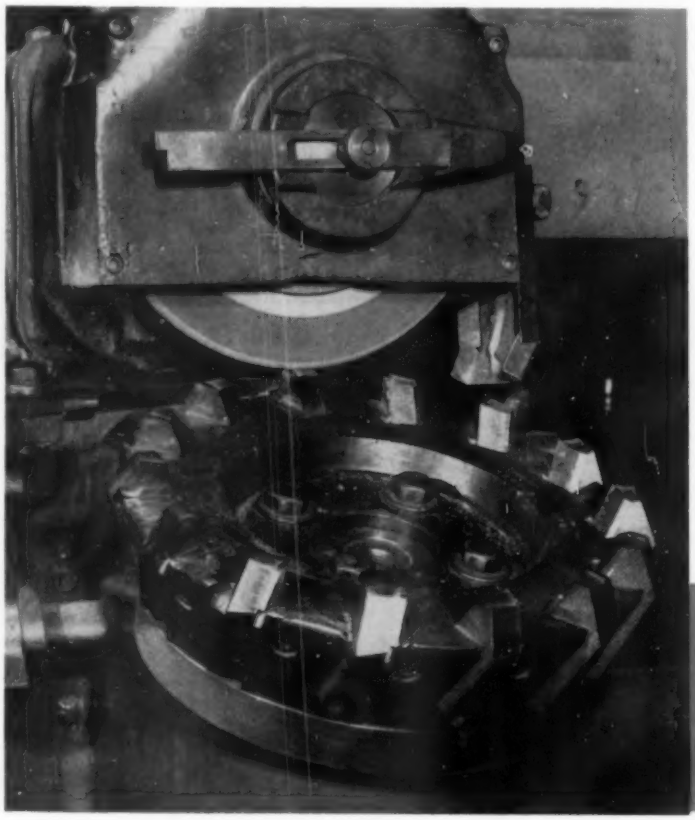


Fig. 3. Here a 10 x 1/2 x 5-inch resin-bonded silicon carbide wheel is used on an automatic face mill grinder to grind both the cemented carbide and the shank steel.

TOOL ENGINEERING REPORT

TOOL ENGINEERING REPORT

Finishes for Metals

Part 1—Cleaning and Surface Preparation

By Robert A. Wason
Associate Editor

This article on surface preparation is the first in a series of Tool Engineering Reports on finishes for metals. Although not planned for publication in consecutive issues, the series will discuss the broad aspects of surface preparation, types of finishes and coatings, general characteristics of finishes, methods of application, and the equipment and processes associated with their application.

FINISHES AND COATINGS are applied to metal parts to preserve the surface and provide a pleasing appearance, *Fig.* 1. These functions can be fulfilled only if the system is applied directly to the surface. Inadequate cleaning and surface preparation can result in ineffectiveness of all later steps. For best results of a finish, all matter foreign to the base metal must be removed. A chemically clean surface can be costly, but when good protection is the goal, anything else is false economy.

Selection of cleaning processes and equipment is based on the nature and adherence of the dirt, the degree of cleanliness desired, number of parts to be treated, and composition, size and shape of the part. Contamination will either mar the surface appearance or will reduct adhesion of the finish.

Since it is difficult to inspect for cleanliness, processes and equipment should be chosen to insure proper cleaning. To meet exacting requirements, it is now possible to measure surface cleanliness. Radioactive stearic acid, for example, is being used as test soil on steel. Residues after cleaning can be "counted", and the efficiencies of various immersion and electro-chemical cleaners can be determined.

Oily and waxy films on metal are usually the greatest sources of adhesion trouble. To test for these, parts can be dipped in water prior to drying. The water will form an unbroken film over the entire surface of the metal if no oils or waxes are present. If the water film breaks into patches, incomplete cleaning is indicated.

There are several types of contaminating residues that must be removed from metallic parts prior to application of either preservative or finishing compounds. These residues include:

1. Materials that may be so firmly attached to the parts that brushing, grinding, buffing, scouring or other mechanical operations must be performed.
2. Organic foreign matter that can be removed by organic solvents.

3. Inorganic materials, such as heat treating salt deposits, dust, chemicals, soldering flux, etching solutions or materials requiring cleaning in water solutions.
4. Perspiration deposits such as fingerprints.
5. General dust and dirt from floor, tables and machines.
6. Corrosive products present in industrial atmospheres.

In almost all plants, dirt is corrosive, particularly when combined with moisture from the air. General dust usually contains traces of acids or alkalies. Perspiration residues in the presence of moisture produce acidic solutions that accelerate corrosion. Metallic chips can cling to metal surfaces and speed corrosion through electrolytic or galvanic action. All such materials, and the results of their activity with each other and the base metal, must be removed prior to finishing the metal product.

Fig. 1. Well-finished products have both protection and eye appeal, but to be lasting, the finish must be applied to a clean surface. At the end of the production line, these automatic washers are crated to preserve the baked enamel finish during transit.

—Photo courtesy Thor Corp.

Mechanical Cleaning

In addition to removing surface impurities and contaminants, various mechanical cleaning processes also affect the physical properties of the base metal. Although the material may be strengthened through work hardening, the dimensions of the part may be altered. When mechanical cleaning processes are considered, special attention should be given to the critical dimensions of the part to be certain that the cleaning process will not be too harsh.

Since adhesion is a matter of anchoring the finish onto surface irregularities, minute crevices must be cleaned of foreign matter but not eliminated. Most mechanical cleaning methods prepare the metal surface by forming additional irregularities in the surface, as well as cleaning those present.

Wire Brushing: It is practically impossible to achieve complete cleaning with wire brushes, either manual or powered, and for volume preparation of surfaces this method is obsolescent. However, there are certain applications, especially during maintenance of finish coats on metal parts, where wire brushing is still the most economical process possible. Where it is only required to remove burrs, scratches and similar mechanical imperfections, wire brushing serves adequately. Brushing can be used on any metal and is especially useful on castings. The major drawback of wire brushing is that wherever the brush fails to remove foreign material, a weakness will develop in the final finish.

It should be noted that when both solvent and mechanical cleaning are to be done, the surface should be cleaned with the solvent first. If parts were mechanically cleaned first, the minute scratches formed would hold the oils and greases.

Barrel Finishing: Because relatively small parts are handled in bulk instead of individually, barrel finishing is frequently the most economical process for preparing metal products for application of organic or inorganic films. It is especially useful for cleaning parts that are not heavy enough for spray washing, or that pack too closely together to be cleaned electrolytically or by soaking. Barrel finishing compares favorably with the surface finish achieved by grinding.

Parts of almost any metal can be barrel finished by the wet process, and all burrs, tool marks and parting lines can be removed, as well as scale and rust. The degree of finish is determined by the types of chips, abrasives or balls placed with the load as well as the solution in which they tumble.

The three processes classed under barrel finishing are: (1) tumbling, which removes metal; (2) rolling, which removes less material, and (3) ball burnishing, which removes no metal. Ball burnishing produces the highest luster obtained by any bulk, mechanical finishing process.

Grinding and Polishing: Most grinding operations done to prepare metal surfaces for application of coatings are offhand. The wheels and disks, *Fig.* 2, are either powered by air or operated on flexible cable heads from an electric motor. Grinding is a secondary fabricating process usually associated with the preparation of castings and welded structures to obtain the correct contour and size for the finished part.

Manual grinding is much used as an adjunct to

semiautomatic chemical cleaning lines. As parts are readied for positioning on the conveyor, they are inspected and ground to remove surface irregularities. Either wheels or disks can be used.

Abrasive belt grinding is proving useful for the preparation of surfaces of contoured parts. Belts can be used to achieve a high degree of polish or for the removal of stock. Abrasive belts can be operated at high speeds because of their inherent cool cutting characteristics.

Because grinding, polishing and buffing are facilitated by the use of coolants and lubricants, surfaces finished by these methods must be given an additional chemical cleaning to remove these surface contaminants.

Blast Cleaning: Dry surface blasting has long been recognized as one of the best methods available for removing rust, tightly adherent mill scale and other foreign materials. It can be a harsh treatment and must be used with care to prevent overstressing the surface and destroying critical dimensions. However, it is a complete cleaning process and when mill scale is present this is important. Mill scale is cathodic to iron and can promote pitting in the presence of moisture. A secondary objective of blast cleaning is to prepare a uniform, dull, rough surface that affords an excellent base for finishes.

When steel is blasted to base metal, all rust, and loose and tight mill scale is removed, as well as the gray oxide binder between the scale and steel. The end result is a base steel surface with an anchor pattern for good paint adhesion. When base metal is exposed, the metal must be given a prime coat or a chemical treatment the same day or flash rusting will result. If the surface is not immediately protected, the benefits of blasting are lost.

Brush-off blasting removes all corrosion products and loose mill scale. Tight mill scale is not removed but is given a good anchor pattern by the rapidly moving abrasive particles. Advantages of this process are that it is quicker and since base metal is not exposed a satisfactory painting surface is available for a longer time.

Blasting is not restricted to iron and steel products but is used with nonferrous metals for similar reasons. Aluminum parts, for example, are given a light blast to prepare a matte surface that is an excellent base for oxide treatment or finish coating. Oxidized stainless steel surfaces can be readily cleaned by blasting.

The texture of a blasted surface depends on: (1) blast materials, sizes and shapes; (2) air pressure; (3) distance of nozzle from work, and (4) angle of blast impingement. All dust and grit must be blown off parts after their surfaces have been blasted.

Sand, abrasive grit, steel shot and irregular steel particles are all used in blast cleaning. Sand is not used as much as formerly because of the danger of silicosis (though this danger has been minimized by modern equipment) and the deterioration of the particles. Also, with the advent of centrifugal blasting machines, heavier particles are needed to achieve desired results.

As an example, by changing from pickling, power sanding and hand methods to blast cleaning, paint peeling troubles were eliminated on heating equipment. The Rotoblast unit, *Fig.* 3, is credited with

Fig. 2. Air operated disk grinders remove weld beads prior to final preparation of the surface for its finish. This step may be followed by wire brushing or blast cleaning of the entire surface of the part.
—Photo courtesy Norton Co.

saving 10 man-hours per heater. Weld slag, mill scale and rust are removed from both hot and cold rolled steel parts in about two minutes and a good bonding surface is achieved. The heaters are finished with two coats of silicone paint. Formerly, both coats were gray, but because of the uniform gray post-blast surface, painters could not be sure two full coats had been applied. Now, the first coat is tan and the contrast insures coverage.

Shortages of sulfuric acid for metal cleaning prompted intensive study of mechanical cleaning methods during World War II. During that time, rapid advances were made in wet abrasive methods of surface preparation. Wet blast cleaning was instigated to achieve good, clean surfaces but without the severity of dry blasting. Dry abrasives of very fine mesh had proved a partial answer but were still too severe for many uses.

Important economies have been effected in the cleaning of close tolerance parts such as machine tools and airplane components characterized by sharp lines and edges or thin-walled sections that must not be altered or destroyed. Tolerances in the order of 0.0001 inch can be maintained by wet abrasive processes.

When wet blasting steel, a rust inhibitor (such as a 4:1 mixture of diammonium phosphate and sodium nitrate) should be used in the slurry. To remove the abrasive particles, a rust-inhibited wash should be used.

Temperature Cleaning

Flame Cleaning: This process is used to clean mill scale from steel by passing a hot flame over the surface. The heated mill scale expands more rapidly than the steel surface and pops off. Cleaning is not as complete as with blasting but satisfactory performance has been obtained.

Paint is usually applied to the metal while the surface is still warm. This precludes the possibility of condensed moisture on the surface and insures satisfactory adhesion. This method has not proved efficient for the removal of old paint films because cleaning is sometimes incomplete.

Enameling iron is sometimes cleaned of drawing lubricants by burning. Such burning should be done at a distance from the enameling section of the plant so scale cannot fly into the enamel or onto ware still in bisque form.

Aluminum can be cleaned by coating it on both sides with a petroleum solvent that has a boiling point of about 350 F and then passing it through a tunnel oven at 425 F. The solvent spreads the grease or oil into a thin film that readily oxidizes at the oven temperature. This cleaning method may result in some softening of intermediate temper aluminum sheet.

Induction Cleaning: Similar in action to flame cleaning, high frequency induction heating equipment is being used to descale steel bars, sheets and parts. The surface of the steel is heated and the mill scale expands off it. Because of its simplicity, this cleaning method can be designed for continuous operation on strip or can be designed into automatic finishing lines.

The iron oxide is not only removed from the surface but it can be salvaged. Cost of descaling by this process is competitive with costs for tumbling, blasting and pickling. In comparison with the latter process, induction heating avoids the problem of waste pickle disposal—an increasingly important consideration.

Powder Washing: Developed for use by foundries in cleaning sand castings, powder washing leaves a good surface for later finishing. The process is faster than chipping or grinding for removing sand inclusions and excess material.

The process combines the oscillating movement of gas welding with a high preheat capacity oxygen gouging nozzle and an externally fed jet of iron powder. The airborne powder is introduced through the preheat flame into the oxygen stream. The burning iron particles speed ignition of the casting surface, stabilize the rate of combustion and attack the sand inclusions by forming a low melting point slag.

Chemical Cleaning

Because various metals can pick up many different types of soil during fabrication, no one cleaning method can be used to meet all requirements. A study must be made to determine the types of contaminants to which the various base metals have been exposed and specific cleaning cycles, *Fig.* 4, must be designed to meet all conditions involved.

Even correct individual cleaning methods are subject to operating variables—water supply, equipment and personnel—that must be considered during the design stage. Once set up, results of the process should be periodically checked to be sure that sufficient cleanliness is achieved.

Solvent Cleaning: Solvents can readily remove mineral or vegetable oils (which make up the bulk of shop soil) by solvent action but they have no effect on inorganic residues unless they are applied with a mechanical action. Even then parts are not usually sufficiently clean for the immediate application of final finishing coats.

Mineral spirits, and hydrocarbon, organic and petroleum solvents—when scrubbed on by brush

or cloth—loosen accumulated oils and break off loose dirt. Instead of completing removal of oil, such methods spread it in a uniform film over the surface of the part. These methods should be used only when no contaminants other than oil and grease are present, and where even these are in small quantities.

Buffing compounds that contain tallow and stearic acid are usually removed by simple solvent washing. This can be done by toluol or xylol because of their high solvency. Cleaners are available that will remove buffing compounds as well as grease and oil. Some of these, such as Zipsol No. 74, can be diluted with up to 10 parts of kerosene or mineral spirits, and they can be used in tanks or sprays. After the grease is saturated, parts are rinsed with warm water under pressure.

Aluminum that has weathered for more than two months provides a good surface for painting when wiped clean with standard solvents or mineral spirits. If new aluminum must be painted, it should be given a thorough chemical cleaning. Oil-free naphtha and benzene are recommended for general cleaning of both aluminum and stainless steel. It is also advisable to use a rotary sander to abrade the surfaces of these two metals to provide mechanical tooth for the primer.

Corrosion resisting steel, nickel-copper alloys, copper and brass can all be cleaned with mineral spirits before painting.

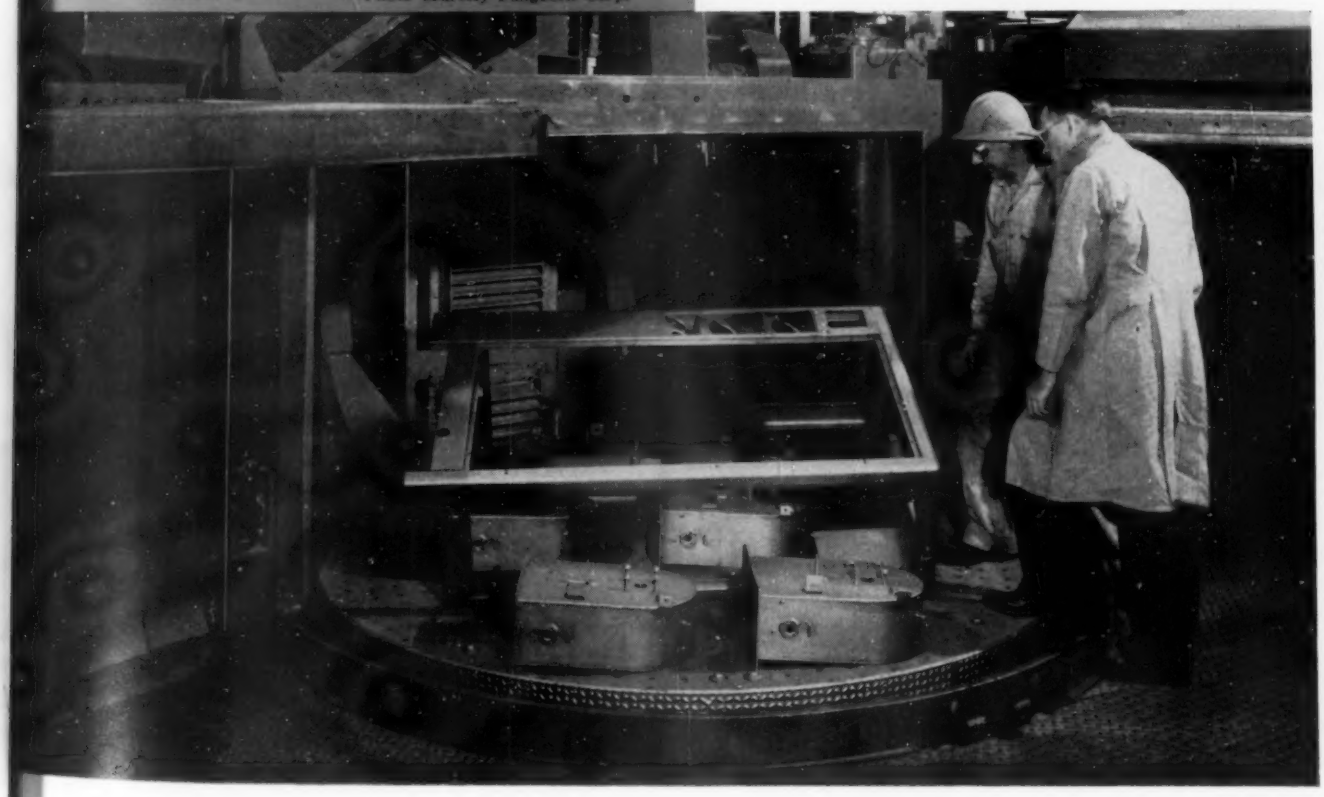
Zinc and galvanized surfaces are coated with a greasy substance that is best removed by weathering for six months. Satisfactory painting of new zinc surfaces can be achieved if they are cleaned with a chemical wash or petroleum solvents such as oil-free naphtha and benzene. Mineral spirits can also be used. Regardless of the type of solvent used oil and grease must be removed.

The use of solvents in tanks has a greater efficiency than hand methods, but still leaves much to be desired. With agitation, loose inorganic dirt is removed, and more of the oils and greases are removed from the metal surface but the tank soon loads up with the contaminants. Then, as the parts are removed, a light film of oil coats them. This difficulty can be overcome by using several interconnected tanks and continuous distillation so that the dirty parts are dipped progressively from the dirtiest solvent tank to one of almost pure solvent.

The standard solvents—naphtha, benzene, toluene, carbon tetrachloride, etc.—introduce hazards to health of operators or fire hazards and must be used with extreme caution.

To reduce the hazard of fire, chlorinated solvents have been developed. However, these solvents are toxic and are more likely to cause skin irrita-

Fig. 3. Cleaned parts have a satin smooth finish and are free of all contaminants. Paint peeling troubles caused by incomplete cleaning are avoided. *—Photo courtesy Pangborn Corp.*



tions than naphtha. They are generally used in vapor degreasing machines that may have any one of four cycles: (1) vapor, (2) vapor-spray-vapor, (3) warm liquid-vapor or (4) boiling liquid-warm liquid-vapor. No matter which cycle is chosen, the part leaves through vapors and is washed with pure solvent. Although expensive, vapor degreasers can clean parts that could not be successfully cleaned by other processes. Chlorinated solvents, like standard solvents, cannot remove inorganic residues.

The most widely used chlorinated solvents are trichloroethylene (boiling point, 190 F) and perchloroethylene (boiling point, 250 F). Ethylene dichloride is also used but is more volatile and will burn weakly.

Not all types of greases, oils and drawing compounds can be removed by these solvents, since some of these materials tend to break down the solvents. There is danger of hydrolysis and formation of hydrochloric acid if moisture is present. All commercial chlorinated solvents have inhibitors to prevent hydrolysis. Neither trichloroethylene nor perchloroethylene will attack magnesium when dry but can cause corrosion in the presence of water. Inhibitors are available that will prevent attack on the base metal when magnesium is cleaned by chlorinated solvents.

Methanol (wood alcohol) is a solvent used to remove perspiration deposits. It is used only after petroleum or chlorinated solvents; never before. It is also both toxic and a fire hazard. When fingerprints or grease spots are known to be present on otherwise clean treated metal surfaces, they can be removed by a solution of 2½ parts naphtha, 2½ parts denatured alcohol and 1 part isopropyl alcohol. The isopropyl is a coupling agent that permits complete blending.

In any of the solvent cleaning processes where the materials are applied by cloths, only washed cloths should be used. Sizing residue in unwashed cloth can cling to the surfaces of treated metals and cause poor adhesion of the final finish.

There are types of soil that cannot be removed readily by either solvents or alkali baths. To bridge this gap, there are addition agents, such as Northwest Presoak Immersion Cleaners, for use with mineral spirits to enhance their solvency. They cause the mineral spirits to penetrate and wet out the entire surface of the part and remove all soil.

Another special type of surface treatment is produced by Composition D, a material that is dissolved in proportions of 4 ounces to 1 gallon of water. It is a solvent that effectively removes soil, and light oils and greases. It produces a wetting action that lowers the surface tension between solids and liquids thereby wetting out the solid particles and leaving a protective coating that repels

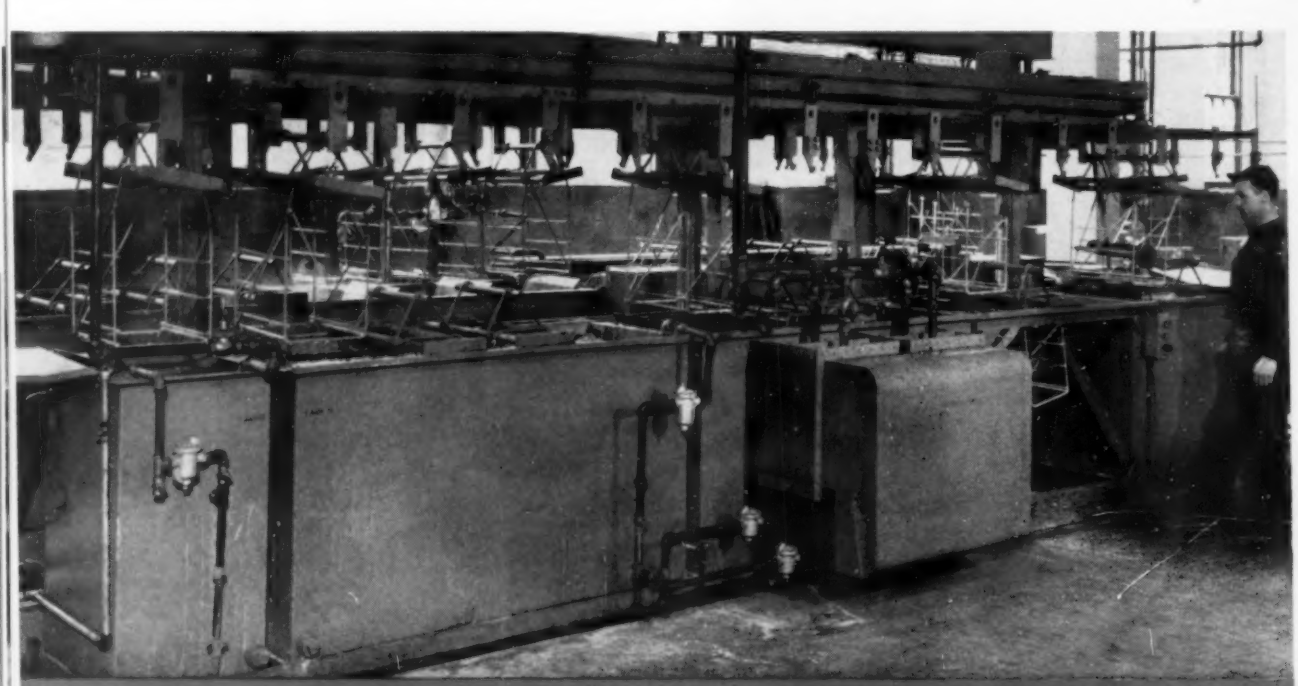


Fig. 4. To meet specific conditions, this automatic cleaning and phosphate coating machine goes through the following cycle: (1) hot emulsion, (2) hot alkali, (3) hot rinse, (4) cold rinse, (5) phosphate coating, (6) cold rinse, (7) hot chromic acid rinse and (8) hot air dry. The chromic acid seals the phosphate coating.

—Photo courtesy Detrex Corp.

the deposition of other solids. It can be applied in all types of cleaning except vapor degreasing. It forms an invisible, non-oily rust preventative coating that can be lacquered over or painted.

Emulsion Cleaning: Self-emulsifying or emulsifiable organic solvents combine actions of a solvent with those of a dispersing agent. The solution usually contains a blending agent. Some emulsion cleaners leave metals clean enough for immediate final finishing but the majority leave a thin film of oil on the parts. This film gives temporary protection against corrosion.

Used as a soak or a spray, emulsion cleaners remove oils, greases and slushes, and buffing, drawing and stamping compounds. They remove deposits of solids that are bound together by soaps, oils and greases. All metals can be cleaned by these materials without danger of tarnishing.

Emulsion cleaners are primarily used as precleaners to remove the bulk of soils and thus lengthen the effective lives of more expensive subsequent cleaning solutions. Drag out from tanks can be high, depending on the shape of the parts, and frequently spray washing is more economical.

The exact mechanism of cleaning achieved by emulsion cleaners is not known, but a commercial product, Pelron Cleaner No. 205, is said to produce an electric charge on soil particles causing them to be repelled by the part. This charge also prevents redeposition of the soil. Emulsification is only partial, the cleaner staying in solution, which means less is needed.

Alkaline Cleaning: Cleaners of this basic type are the most widely used for cleaning metals prior to finish coating. The solutions saponify vegetable and animal fats and oils, and emulsify mineral oils and greases. To be effective, alkaline solutions must penetrate layers of dirt and must wet the surfaces of the metals. Alkaline methods are flexible and introduce no fire hazards or toxic fumes. Solutions can be used in tanks, can be sprayed and can be used in steam cleaning equipment. Parts cleaned by alkaline solutions must be thoroughly rinsed because residues can cause stains and poor adhesion.

Originally, alkaline cleaners were very similar and were used in varying strengths for different times on the various base metals. Now, however, they are complex formulas for specific cleaning jobs. In addition to the basic alkali, cleaners are buffered to maintain pH in the proper range, are combined with solvents, have various detergency increasing compounds and are inhibited to prevent attack on base metals. Almost any combination of properties can be obtained. There is now even a choice between hot and cold solutions, although most cleaning is done with hot solutions.

The correct alkaline cleaner can be selected only by testing recommended cleaning solutions under conditions as close to actual production as possible. Aluminum, for example, would be strongly etched and pitted by a cleaner that might be perfect for removing the same type of soil from steel. Magnesium is not attacked by strong alkalies, but has a tendency to react with soaps to form insoluble films that are hard to remove.

To speed the action of alkaline cleaning, solutions are frequently used with direct current to produce electrolytic cleaning. In this process, the work is either the cathode or the anode and the solution is the electrolyte. Electrolysis of the solution produces hydrogen gas at the cathode and oxygen gas at the anode. As the bubbles of gas form, they lift soil from the surfaces and produce

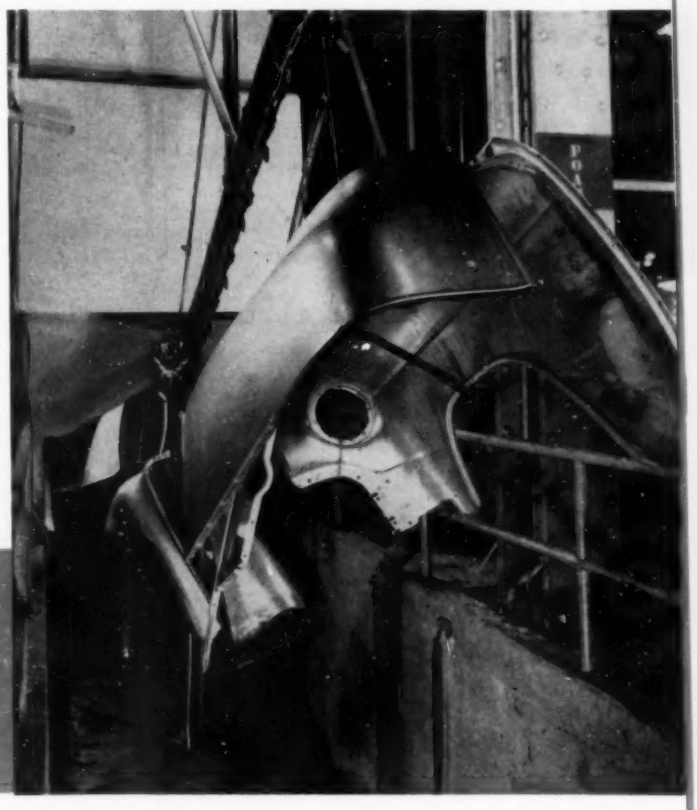


Fig. 5. Automotive parts are formed, inspected, mechanically finished and placed on a conveyor line that leads through an alkali wash and a Bonderizing unit. The dip in the conveyor permits hooding the end of the tunnel to restrict passage of vapors.
—Photo courtesy Chevrolet Motor Div., General Motors Corp.

finishes for metals

a scrubbing action. Twice as much gas, and therefore twice as much activity, is produced at the cathode as at the anode.

Steel is usually cleaned as the anode (reverse current cleaning) to avoid the possibility of hydrogen embrittlement. Soils are "unplated" by this process. Some commercial electrolytic cleaners remove scale and rust as well as oils and greases.

Nonferrous metals are generally cleaned cathodically, although some cleaners are now formulated to permit anodic cleaning. General anodic cleaning is not practical because oxides and tarnish form on the metal surface. However, anodic oxide coatings are purposely formed on aluminum to give a good surface for painting. Less expensive oxide coatings are also formed chemically on aluminum. The majority of nonferrous electrolytic cleaning cycles are designed for a soak or a long cathodic period followed by a short anodic period. The few seconds of anodic action is to remove the smut that forms on the work surface.

For finishing parts with paint, standard electrolytic cleaning methods are satisfactory. Present refinements in electrolytic cleaning are aimed at improving preparation of parts for subsequent electroplating. Such parts must be metallurgically clean as well as chemically clean. Poor paint adhesion is sometimes caused by etching of the surface during anodic cleaning, or a deposit of smut or metallic residues during cathodic periods. Proper regulation of the cycle can prevent these troubles.

Alkali solutions used in electrolytic cleaning are basically similar to standard soak tank cleaners except they are formulated to have higher electrical conductivity. Electrolytic cleaning is usually carried on in the ranges from 6-12 volts and 10-100 amperes. Higher voltages and amperages cause more solution activity.

Foaming can be a problem at high currents, but correctly balanced cleaners blanket the surface of the tank with bubbles to prevent spraying of the hot alkaline solution. The blanket, however, must not restrict escape of hydrogen and oxygen gases or there is the possibility of explosion should a spark be caused during unloading.

The present trend is away from separate steps for alkaline cleaning and formation of a metallic phosphate coat on the surface of steel parts. Dual-purpose compounds are available that both clean the surface and form a phosphate coat in one operation. Workpieces leave the tank clean and with a corrosion resistant coating that serves as an excellent paint base. The passivated surface gives a second advantage during the life of the final finish. Should the finish film and the phosphate coat be removed at a scratch, the exposed metal will rust but the corrosion will not spread under the paint.

Phosphate Coating: Many solutions can clean metals and apply phosphate coatings or both. The thickness of the phosphate coating is dependent on how long the part stays in the bath after the surface has been cleaned of foreign matter. To achieve accurate thickness of phosphate coatings, many plants give a standard alkaline cleaning followed by any one of a number of commercial phosphating treatments, *Fig.* 5.

When phosphoric acid rinses are used on steel with mill scale still attached, the rinsing steps are most important. The acid solution can gather under loose edges of otherwise tight mill scale, and if not rinsed out can cause early blistering of the paint.

All phosphate baths sludge to some extent but, if the phosphate is deposited at a fast rate and the sludge is controlled, it will have no effect on the coating or on the life of the bath.

A particular commercial solution, Chem-Bond, is used for producing phosphate coats on iron, steel, galvanized iron, zinc, aluminum, copper and brass. It cleans the metal, removes rust and provides a paint bond. Crystals of the phosphate coating lie parallel to the surface of the part and combine with it. This characteristic results in better impact resistance for any coating applied over it. Also, the phosphate coating has a reduced porosity which means less finishing material is required.

Proprietary iron phosphate cleaners, Houghto-Clean 313A, have good wetting and detergent characteristics, remove processing oils, perspiration, soldering residues, rust preventatives and dirt, and leave a light phosphate coating. Parts are rinsed in water and then in dilute chromic acid. This converts any cleaner left on the surface to sodium chromate, which adds further protection to the steel. Another compound, Metex Durafos, produces a conversion coating with iron and steel and leaves a light phosphate film on zinc and aluminum.

Organic finishes do not adhere well to untreated zinc surfaces. A phosphate pretreatment will greatly increase the adhesion.

In general, dual-purpose cleaners deposit a lighter phosphate coat than do two separate steps. The weight of the coat primarily depends on the strength of the solution, time and temperature.

Authorities are not yet in agreement as to the general desirability of thick or thin phosphate coats. At present, it seems that accelerated life tests on finished paint systems provide the only reasonable way of determining whether a thick or thin coat is advisable for a specific application.

To extend life of fabricated steel parts, Paintgrip is standard cold rolled steel strip plated with zinc (0.00001 in. minimum) on both sides and with a mill-applied phosphate coat. This treated

out solutions. Other additives accelerate runoff of work through to the base metal without dest

material will take any forming operation that cold rolled steel will and any draw not requiring intermediate anneals. When formed, surfaces need only be given a solvent wash to be ready for painting.

Pickling: Pickling is simply the chemical removal of surface oxides from metals by acid solutions. However, acidic solutions cannot work uniformly on metal surfaces that are coated with oil or other substances not soluble in acids. The oxide scales that form on iron and steel at high temperatures have much different physical properties than the base metal.

The most common pickling solutions are based on sulfuric and hydrochloric (muriatic) acids. Nitric and hydrofluoric acids are used for some other applications. Sulfuric acid attacks the base metal under the scale and thus loosens it. Hydrochloric acid costs more than sulfuric and is used less, but scale is more soluble in it.

Inhibitors, acid additives, act to reduce the acid attack on the clean base metal without lessening its effect on or under the rust, smut and scale. Upon withdrawal from pickles, parts must be thoroughly rinsed and positively neutralized by an alkaline rinse or breaks can form in the finish paint.

Pickling fumes from hydrochloric acid solutions can cause physical discomfort and damage to the pickling and surrounding facilities. A dense foam can be formed on acid solutions by commercial additives that prevent excess fuming. Since hydrochloric acid cannot be used hot because of its high volatility, it is used at room temperature but in concentrations double those for sulfuric acid.

Some special commercial acid type solutions have a dissolving action on rust, mill scale and especially oxides formed during heat treating or annealing. They do not attack the base metal, and control acid fuming and hydrogen embrittlement.

Standard cleaning techniques for wrought aluminum work well on castings of that metal. Since magnesium should never be painted directly over bare metal, magnesium parts are generally cleaned with a chrome pickle. This passivates the surface and leads to good paint adherence. The chrome pickle also provides protection during storage.

Most enameling sheet is pickled by the maker, in which case it need only be cleaned. If it must be pickled, the following cycle can be used: dip in boiling cleaner, hot rinse, 6-7 percent sulfuric acid soak, boiling rinse, neutralize and dry. Sometimes a 5-minute soak at 140 F in a solution of 3-4 ounces of double nickel salt per gallon with a pH of 5.8-6.2 is used to avoid several enameling difficulties. The soak promotes good adhesion of the ground coat to the metal and lowers the firing range which reduces warping. Too much nickel will cause small blisters in the ground coat.

Rinsing and Drying

Water rinses are used between most steps in the preparation of surfaces for painting because it is the cheapest solvent available. Purpose of all rinses is to remove the solutions of the preceding process so there will be no carry-over to succeeding tanks and to remove the soil loosened by the previous process.

Rinses are usually hot and should be applied under pressure in most instances. Various additives can be used with water to achieve greater detergency and wetting, and to neutralize any drag

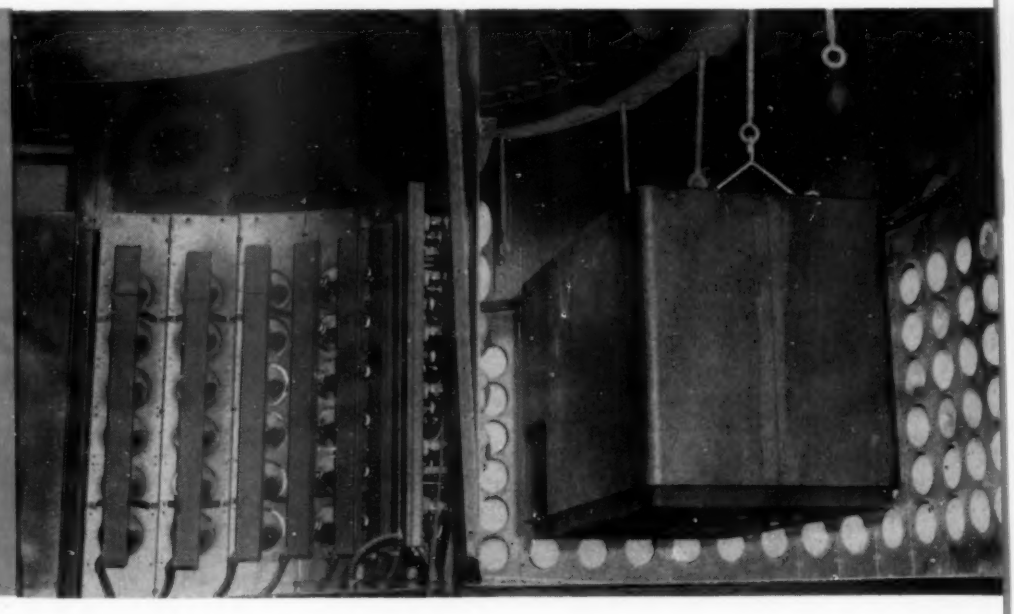


Fig. 6. After application of a phosphate coating and a final rinse, this home freezer unit passes through a bank of infrared lamps to insure complete drying before application of the prime coat.

—Photo courtesy Nash-Kelvinator Corp.

out solutions. Other additives accelerate runoff of water from parts to speed drying.

Most cleaning compounds have some lime sequestering ability so that water hardness will have no great effects during metal cleaning operations. For extreme conditions, special compositions can be added to prevent cleaning solutions from being covered by lime soap scums that would tend to coat parts as they are withdrawn from the tanks.

One commercial compound, Oakite Composition No. 53, has been developed for adding to cleaning tanks, spray washers, burnishing barrels and soluble oil emulsions, as well as to rinse water. The additive possesses wetting, emulsifying and dirt suspending properties that make it more than just a water softener. It can also be used with paint strippers in which certain ingredients tend to combine with paint oils and form soaps that bind the pigments to the metal surface.

Immediately after any cleaning method, except vapor degreasing, parts should be dried to prevent corrosion by residual moisture. Compressed air blasts, ovens or infrared lamps, *Fig.* 6, are the best drying methods. Whatever method is used, parts should be thoroughly dried but not overheated. Hand drying with cloths should be done only as a last resort. If any contact is required between operators and cleaned parts, it should be through clean canvas gloves.

Strippers

Production finishing economy is closely related to the successful and rapid reclamation of parts rejected because of imperfect finishing. Paint strippers are available for hot or cold application in dip tanks and conveyorized machines, and for manual spreading. Strippers have been formulated for individual coating removal and no single remover will work for all finishes.

Most finishes are formed of large molecular masses in many layers that form a porous latticework. Although this structure is impervious to most fluids, chemists have developed compounds, such as Unisol 503, that will infiltrate the film and work through to the base metal without destroying the film. When adhesion is broken, the paint can easily be removed intact and with no gumminess or dissolving into the stripper. In most instances the parts can be refinished without cleaning.

Many paint and varnish removers are actually alkaline sodium compounds of caustic soda, soda ash and washing soda dissolved in water. These are widely used on iron, steel and magnesium but must not be used on metals subject to alkaline attack. Strong (2-3 pounds per gallon of water) hot solutions of trisodium phosphate are used for removing paint and varnish from steel, and are safer to handle than caustic soda.

Paint, varnish and lacquer can be stripped from aluminum alloys without surface attack by water solutions of sodium metasilicate, sodium trisilicate and sodium resinate. The process can take only a few minutes or several hours at 190 F, depending on the film to be removed.

Solvent type removers can be flammable (benzol, acetone and amyl acetate) or nonflammable (chlorinated hydrocarbons). Many removers of these types contain paraffin wax that must be washed off the surface with alcohol or benzine. Otherwise, the reapplied finish will not dry or adhere properly. Manufacturers produce both flammable and nonflammable solvent cleaners that do not require washing.

Removing defective porcelain enamel introduces economies to enameling operations because parts have considerable value by the time they are enameled. However, the equipment required to successfully strip such enamel precludes in-plant processes. A company has been set up using a hot caustic bath, a water rinse and a pressurized sand spray to remove defective enamel coatings.

When enamel or varnish finishes must be repainted, but where removal is not required, a clear nonabrasive fluid, Preparite, can be used. This commercial solution removes wax, deadens gloss and forms a slight tack to produce a bond with the new coat. There is no caustic residue to wash off or neutralize and the parts need not be sanded.

(To be continued)

Acknowledgments

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THE TOOL ENGINEER
REFERENCE SHEETS

Stock Gages for Dies

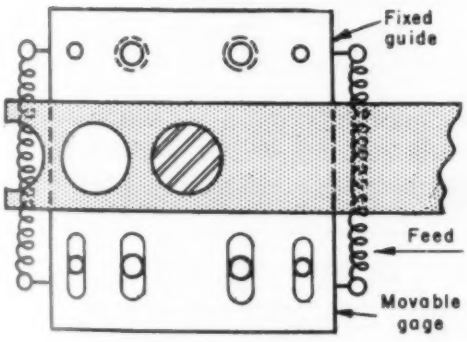
By Federico Strasser

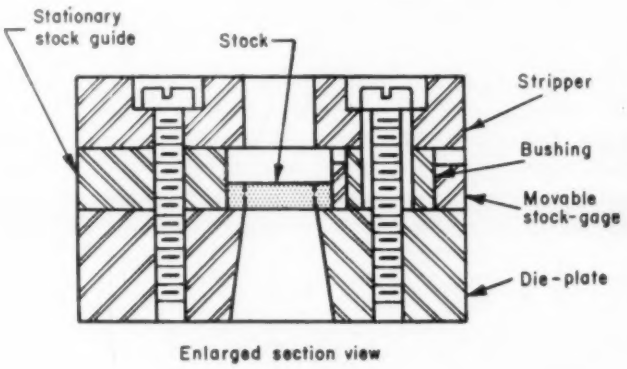
Santiago, Chile

SELF-ADJUSTING STOCK GAGES or guides are widely used in blanking, cutting off and progressive dies to positively position material, whether strip or coil stock, and compensate for width variations, irregularities, and deformations from press operations.

Some toolmakers and designers favor making the entire gage movable; others prefer the partially movable types. Plunger or finger types are also popular, as are devices to hold the strip prior to entering the die. Presented here is a wide variety of gages adaptable to many conditions.

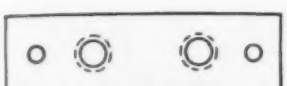
In any of the gages using springs the correct tension is of paramount importance. If too great it will cause feeding difficulties; if too weak the gage will be inefficient. Numerical data are lacking in this respect; only actual trials can establish the spring tension to apply.

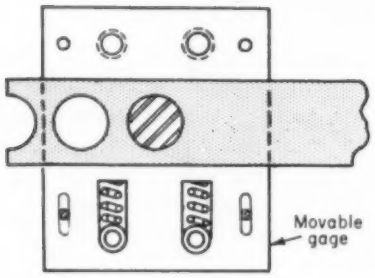




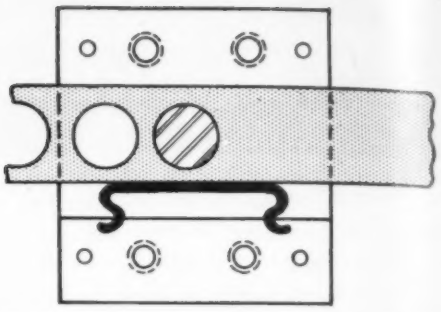
Enlarged section view

EXTERNAL HELICAL SPRINGS attached with hooks to fixed guide and movable gage provide an easy means of equipping an existing die with a self-adjusting stock gage. Elongated holes for the dowel pins and holding screws permit transverse movement of the gage which is thinner than the fixed guide and bushings. The springs are located to pass under the stock.

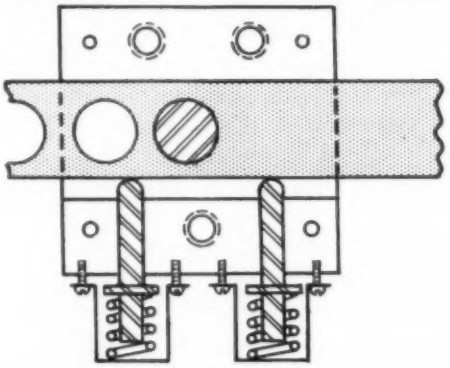




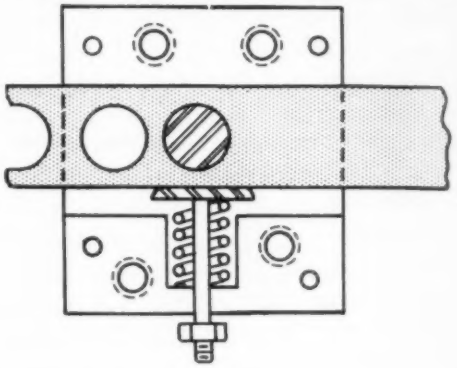
INTERNAL SPRINGS installed in elongated holes where screw bushings are located can be used with new dies. The movable stock gage is widened to make room for the installation.



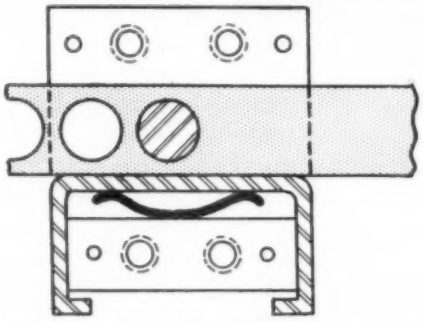
FLAT SPRING becomes the gage element itself in this design. The spring must be formed to permit free movement of the stock. Dovetail slots in the fixed packing piece hold the spring.



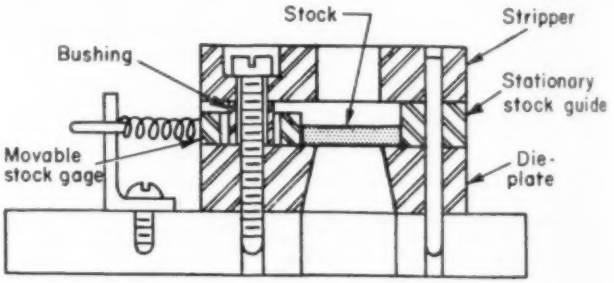
LONGITUDINALLY DIVIDED GAGES have a stationary shell and movable inner part. The outer part matches the stationary stock guide on opposite side of the die while the inner movable section must be somewhat thinner.



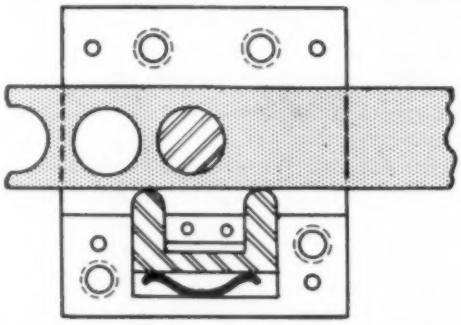
SHOE AND STEM type gage with helical spring can be readily adjusted.



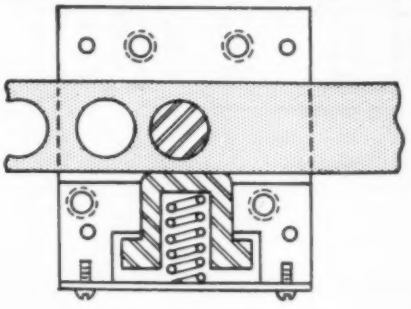
FLAT SPRING ACTUATES the movable stock gage for limited space applications.



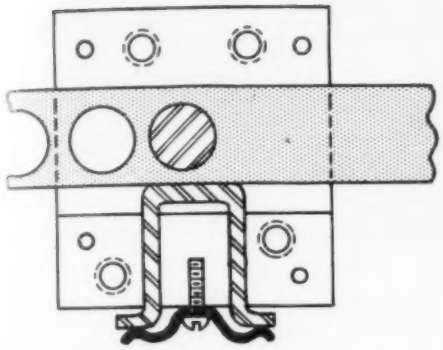
EXTERNAL PUSHER SPRINGS can be used if the tool is too small to permit internal arrangement.



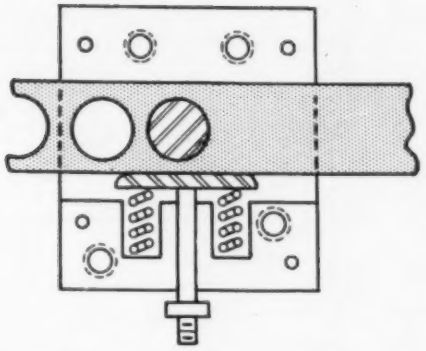
A DERBY HAT SECTION with flat spring makes up the parts of this completely internal gage.



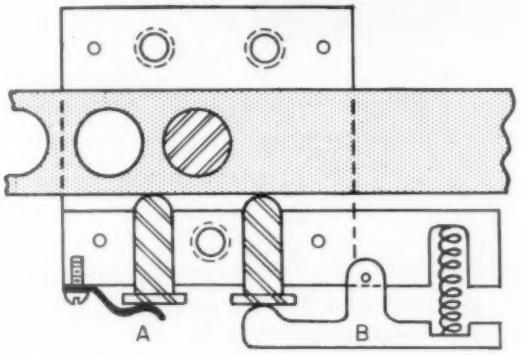
INTERNAL U SECTION with helical spring is used in this design which is readily disassembled.



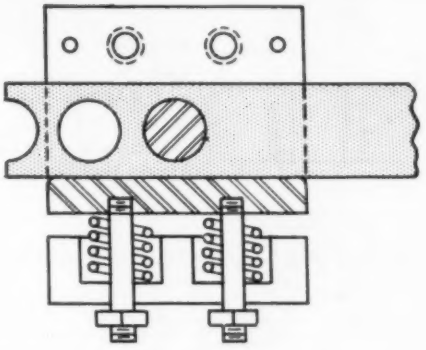
A U-SHAPED BLOCK actuated by a flat spring serves as the stock gage.



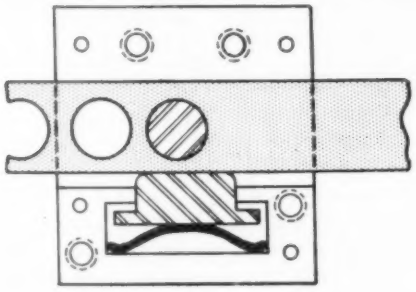
SHOE AND STEM type gage with double helical springs for constant pressure in punch zone.



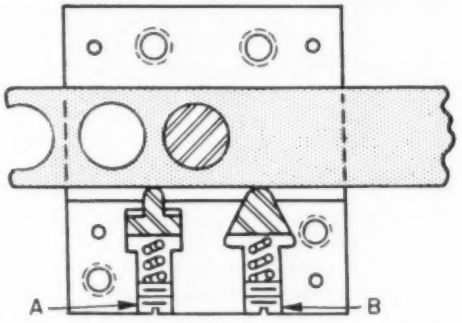
SINGLE FINGER types of internal stock gages are shown in the two alternate designs in *A* and *B*, using flat spring and helical spring with lever respectively for actuation.



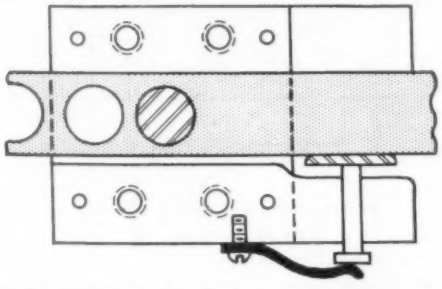
EXTERNAL HELICAL SPRINGS may be used with finger type gages if the die is small and there is insufficient space inside the packing piece.



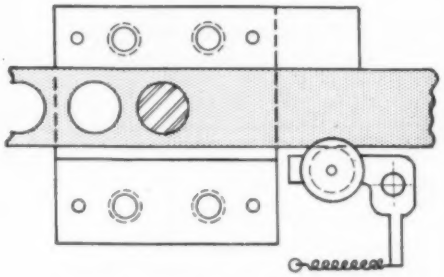
TWO FINGERS WITH A COMMON BODY actuated by a flat spring comprise this internal stock gage.



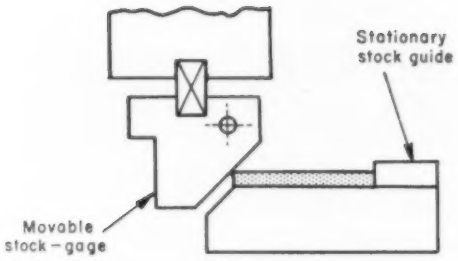
ALTERNATE FINGER designs with two means of limiting travel of the gage are shown in *A* and *B*.



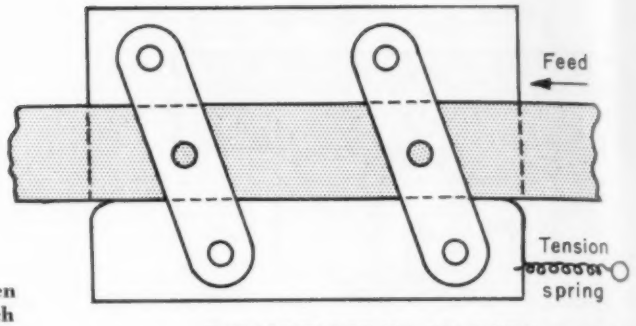
EXTERIOR HEAD TYPE stock gage, installed on the entering side of the tool, uses flat spring.



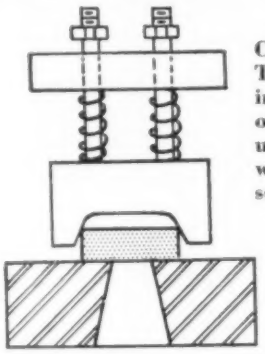
PIVOTED BELL CRANK WITH ROLLER is an alternate type of exterior mounted gage.



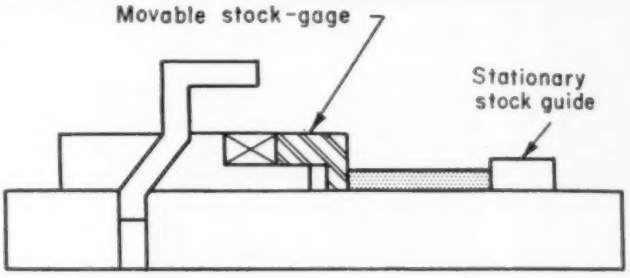
INTERMITTENT STOCK GAGE operates only when the ram comes down; the spring between punch holder and gage provides the linkage. When the press ram is up, the stock gage is quite loose permitting free movement of the strip.



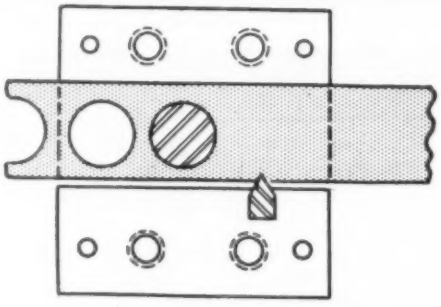
PARALLELOGRAM OF BARS can also be used to center the strip. The fulcrum pins must lie in the exact axis of the die.



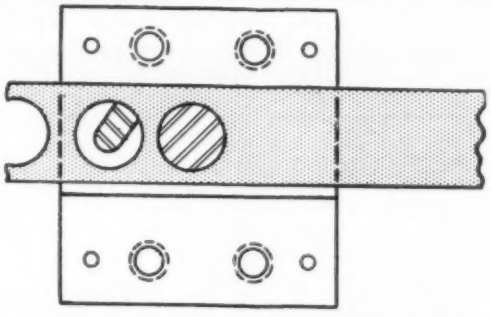
CLAMP TYPE CENTERING GAGE must be installed on both sides of the die, limiting its use to operations where the strip is not severed.



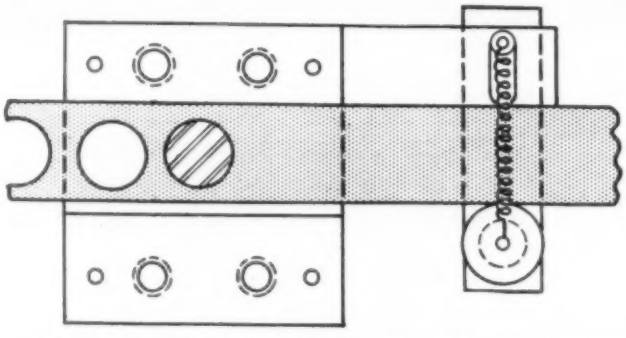
CAM ACTUATED SLIDE and spring force the stock gage against the stock during the press operation in this design.



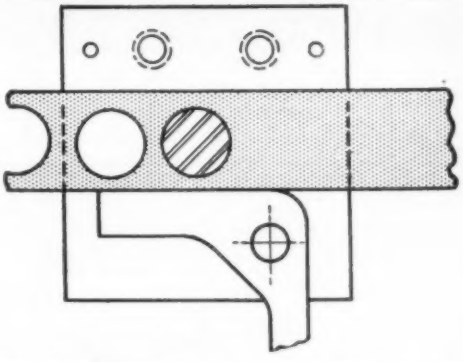
A HEELED AND POINTED PUNCH pushes the strip against the fixed stock guide. The auxiliary punch is longer than other punches.



NO MOVING PARTS are used in this stop-gage. It is situated obliquely, so that its outer arc forms a wedge with the fixed stock guide. As fed, the strip pushes against the stop-gage, positioning it with respect to the cutting openings and against the backstock guide.



TENSION SLIDE AND SHEAVED ROLLER mounted on an extension of the back guide, is another example of an exterior gage.



MANUAL STOCK GAGE consisting of simple lever is designed for handling heavy stock. It can be operated by the left hand, leaving the operator's other hand free.

news

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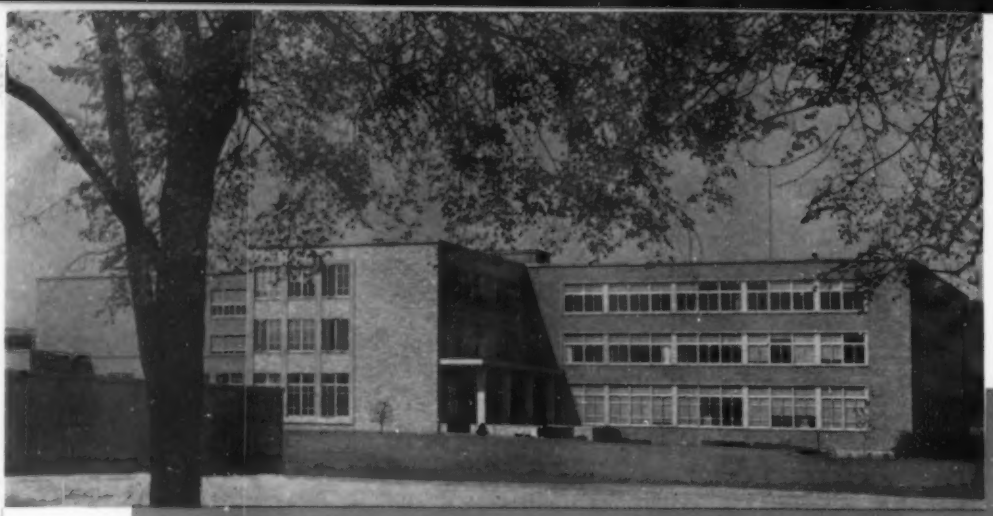


University of Wisconsin's engineering building, left, will serve as headquarters for the Institute on Tool Engineering. Sessions at the University of Illinois' Tool Engineering Conference will be held at the new mechanical engineering building, pictured on the opposite page.

ASTE Chapters to Sponsor On-Campus Engineering Conference

By Nancy L. Morgan

Latest information on some of today's most pressing problems in tool engineering will be presented at two outstanding on-campus conferences scheduled for November at the University of Illinois and the University of Wisconsin. Both meetings will be co-sponsored by chapters of the American Society of Tool Engineers.

On November 14 the University of Illinois and the eight ASTE chapters in the state will hold their third annual Tool Engineering Conference at Urbana. This year's program will feature discussions by university and industrial speakers on automation, tool engineering and the production worker, and practical applications of the thermal number.

The following week the Institute on Tool Engineering, sponsored by the University of Wisconsin and the Madison ASTE chapter, will offer a series of sessions on machine tool design and application techniques at a three-day meeting which opens in Madison on November 18.

Invitations to attend the Illinois program have been extended to national ASTE officers by the conference committee, headed by Larry Doyle, and Harry A. Paine, chairman of the Chicago chapter which is acting as host chapter for the conference. Plans are also being made to hold a joint meeting at Urbana of ASTE's National Education and Professional Engineering committees.

College Tours

Activities will begin with registration at the mechanical engineering building. Tours of the College of Engineering will take visitors through the electrical and mechanical engineering departments, and the physics and electronic computer laboratories. Continuous showings of specially selected industrial movies are also scheduled.

A lecture on "Practical Applications of the Thermal Number" will be given by Kenneth J. Trigger, professor of mechanical engineering at the University of Illinois. His discussion will be the only strictly technical session held in the morning.

After luncheon at the Illini union building, conference participants will meet for a panel on automation. Speakers will be: J. H. Mansfield, chief engineer at Greenlee Brother and Co. from 1918 through 1952 and now a consulting engineer; Harry Conn, chief engineer, Scully-Jones and Co., and M. J. Murphy, editor of *Factory Management and Maintenance*. Their topics will be: automatic transfer equipment, tooling problems of automation, and present and future developments in automation.

At the final technical meeting, ASTE members will hear from W. Gomberg, vice president of the Ladies Garment Workers Union, who will discuss "La-

bor Looks at Tool Engineering," and John A. Patten, president of the firm of management engineers which bears his name, who will speak on "Are Tools Motion-Wise?"

Dinner Meeting

Climaxing the program will be a dinner and social hour held at the Urbana Lincoln Hotel. For the wives on hand for the conference, a schedule of ladies' activities has been arranged. Tours will be conducted through the home economics, fine arts and florticultural departments. A music recital is planned for the afternoon along with other entertainment. As a special service, nursery and baby sitting facilities will be made available.

Members of the conference committee include all chairmen of the participating ASTE chapters, Tom Barber of the National Program Committee,

(Continued on next page)

A. O. Schmidt, left, research engineer with Kearney and Trecker Corp., will lecture at the Institute on Tool Engineering.

E. C. Helmke, center, is chairman of the Madison ASTE chapter, co-sponsor of the University of Wisconsin program.

Werner Senger, right, vice president in charge of balancing engineering at Gisholt Machine Co., is another institute speaker.

Chapters Sponsor Engineering Conferences

(Continued from page 85)

John Beck who is first vice chairman of the Chicago chapter, H. Verne Loeppert who is chairman of the Chicago public relations committee, Prof. Kenneth J. Trigger and Prof. Leo Pigage of the University of Illinois.

University Certificates

Special certificates will be presented to the engineers who participate in the Institute on Tool Engineering, in recognition of their attendance at the intensive three days of technical lectures at the University of Wisconsin. The presentations will be made on November 20, the closing day of the conference, by Paul J. Grogan, director of engineering institutes at the university.

Others who have assisted in the planning of the program are: George R. Sell, institute coordinator; E. C. Helmke, chairman of the Madison ASTE chapter; Arnold Griswold, chairman of the education committee; and Edward Skidmore, Assist. Prof. Roy Lindberg, Assoc. Prof. James Gage and Assoc. Prof. C. A. Gilpin, chapter members. ASTE representatives on the committee will also serve moderators.

Registration for the conference will take place on November 18 from 8:30 to 9 a.m. in room 2016 of the new engineering building, Randall at Johnson Street in Madison.

The first lecture will be given by A. O. Schmidt, research engineer at Kearney and Trecker Corp. He will discuss basic machine processes, covering tooling for production, designing cutting tools, and tooling and its effect on increasing production and decreasing costs. Presiding at this session will be Chairman Helmke of the Madison chapter who will welcome the group to the institute.

That afternoon a technical program will be offered by Werner Senger, vice president in charge of balancing engineering at Gisholt Machine Co. He will talk on statics and dynamics in the balance of machine parts.

In another lecture, Bennett Burgoon, Jr., of Kennametal, Inc., will discuss a practical approach to efficient machining, including the effects of forces and vibrations on tool life, trend in carbide tool design, and chip studies.

A dinner meeting, the only one during the conference, is scheduled for 6:30 p.m. on November 18.

The following morning, J. H. Tech... nick, executive vice president of the E. W. Bliss Co. will talk on press work problems. His lecture will cover applications, die design and tooling and selection.

Plant Visitation

W. R. Carnes, president of the W. R. Carnes Co., will speak on spinning vs. drawing when the entire group travels to Verona, Wis., to visit his plant on November 19.

The calendar for the last day of the institute lists a lecture on broaching to be followed by a talk by Mr. Kuhnke of Hanna Engineering Works who will speak on air and hydraulic control mechanisms. The final technical session will feature a talk on plastic molding by Quenton M. White of the F. J. Stokes Machine Co.

News coverage and pictures of the Institute on Tool Engineering and the Tool Engineering Conference will be published in the January issue of THE TOOL ENGINEER.

Prof. Kenneth J. Trigger of the University of Illinois is one of the program speakers at the Tool Engineering Conference at Urbana.

Prof. Larry E. Doyle, chairman of the ASTE National Professional Engineering Committee, is chairman of the Illinois conference committee.

Harry Conn, chief engineer at Scully-Jones & Co., Chicago, will speak at the conference on the topic "Tooling Problems of Automation."

Society Welcomes Muskegon Chapter

With a roster of 130 members, including National ASTE President Roger F. Waindle, the Society's 111th chapter was chartered in Muskegon, Mich., on September 22. On hand for the event were Mr. Waindle; L. B. Bellamy, immediate past president; Howard C. McMillen, third vice president; W. B. McClellan, a national director for 1952-53; and Harry E. Conrad, executive secretary.

Invitations were also extended to officers from neighboring chapters at Lansing, Ann Arbor, Jackson, Pontiac, Saginaw, and Detroit. The largest contingent of visitors, headed by Chairman Harry J. Swanson, came from the Western Michigan chapter at Grand Rapids.

Officers of the newest chapter in ASTE are: chairman, Paul Hornak, Jr.; first vice chairman, Herbert Steinman; second vice chairman, Vern Nephew; secretary, Ervin Byro; and treasurer, John Baker.

After the election which was conducted by Mr. McClellan, the oath of office was administered by Mr. Bellamy. Presentation of the charter was made by President Waindle.

Program speaker at the meeting was Kem Haagensen, director of public relations for Allis-Chalmers Co., Milwaukee, Wis. His inspirational discussion on positive thinking and how it affects the life of the individual, his company, his community and his country was most rewarding.

Mr. Haagensen said "True happiness comes only from service and giving of one's self. The success story of the Muskegon ASTE chapter will be written through the efforts of its members and their contribution of time and ideas. And just as a chapter of ASTE benefits from constructive thinking and work, so does the city in which it is located.

"This same philosophy must be applied by all of us in selling democracy and our own way of life in order to conquer communism," he urged.

Among the guests who attended the chartering were: the Rev. Emerson Jury, St. Luke Evangelical Lutheran Church, who gave the invocation; J. Eklund, Whitehall Chamber of Commerce; J. T. Hay, Muskegon Chamber of Commerce; and Dr. D. F. Seyferth, Muskegon Manufacturers Association. Representing industrial firms in the Muskegon area were: H. E. Morton, Morton Mfg. Co.; D. Johnson, Motor Specialties; J. R. Kelley, Manning, Maxwell & Moore, Inc.; G. P. Kennedy, Norge Division of Borg Warner Corp.; H. J. Jacobi, Brunswick-Balke-Collender Co.; and Mrs. James Patton who aided in the organization of the chapter.

Visitors from Detroit included Marvin Bunting, secretary of the National Membership Committee; Nancy L. Morgan, news editor of THE TOOL ENGINEER magazine; and Edith R. Saunders, assistant news editor.

The first of ASTE's new plaques for affiliate members was presented at the Muskegon chartering to the Madison Mfg. Co. Designed in colors of blue and gold, the plaques are available to all chapters for presentation to companies holding affiliate memberships in the Society.

From left: Kenneth R. Blake, of the Metalloid Corp., and technical speaker for the evening discusses a point of his talk with David A. Gustafson, chapter chairman, Ted Roher, past chairman, and Noel J. Frisch at a Golden Gate meeting.

Piedmont ASTE Program Features Chief Engineer

Winston-Salem—The first regular meeting of the current season was heralded by the Piedmont chapter on September 14 at the Hotel Robert E. Lee. Close to 100 members and guests were on hand.

Featured technical speaker was John A. Harrington, chief engineer of the DoAll Co. His talk, entitled "Surface Finishes and How to Attain Them," covered existing misunderstandings regarding surface finish, surface finish standards, their use and measurement, and how to attain these standards. Of most interest to the group was his explanation of the frequently encountered tendency to confuse reflection with surface finish.

The annual "Executives' Night Banquet" is next on the agenda of Piedmont chapter activities. It is planned for November 9, and scheduled to hold forth at the King Cotton Hotel in Greensboro, N. C. It is so-called "Executives' Night" because each member makes a special effort to bring officers from his company with him for the special program.

The program committee has contacted William H. Neal, senior vice president of the Wachovia Bank and Trust Co. of Winston-Salem as featured speaker of the evening.

Also on the program is C. W. Reynolds, manager of manufacturing engineering. Western Electric, coffee speaker, famous locally in this role.

—Henry H. Palmer

Positions Available

TOOL AND MACHINE DESIGNERS—

One of Cincinnati's largest permanent design firms has openings in their own office for experienced machine, product and tool designers, and detailers.

Recent engineering graduates or students will also be given consideration. These are permanent positions with a substantial, stable leader in the field. We can offer top starting wages, modern working conditions, paid holidays, vacations, and other benefits. Our policies assure varied experience and unusual opportunities with a future.

New employees would be expected to settle on a permanent basis in Cincinnati. Please send resume to Cincinnati Designing, Inc., 8120 Blue Ash Ave., Cincinnati 36, Ohio.

Schmitt Named Ohio Sales Engineer

Charles E. Schmitt, former machine and tool buyer of the Cleveland Cadillac Tank plant, has been named Ohio sales engineer for the Ace-Central States Machine Tool Co., of Detroit.

A mechanical engineer, Schmitt has been associated with the tool and die industry in Detroit and Cleveland for many years as a tool maker, tool designer, and sales engineer. While with Cleveland Cadillac Tank, he bought the plant's special tooling and machinery from tool and machine factories throughout the country. Mr. Schmitt is a member of the Cleveland chapter.

K. R. Blake Talks on "Dynatomics"

Oakland, Calif.—A stimulating evening was reported by the 150 members of the Golden Gate chapter who gathered at Bellini's Restaurant on September 16 for their first fall meeting.

The mental stimulation was the result of a talk on "Dynatomics" by K. R. Blake of Metalloid Corp., Huntington, Ind.

"Dynatomics" is the word Mr. Blake used to describe the study of movement of atoms in metal during deformation and rupture. As an example he offered the atomic movement when a tool bit pushes steel beyond its rupture point, resulting in cutting off a chip. He made pronouncements which were startling to his listeners.

Mr. Blake said that steel has an internal energy dependent upon the position of the atoms in the crystal lattices making up the steel. Cold drawing, for instance, imparts additional internal energy to a hot-rolled bar. For the same piece of steel, the more internal energy present, the less energy is required to machine it. This is his explanation of why cold-finished bars machine more easily.

While many of the listeners did not agree with Mr. Blake's ideas, all enjoyed the discussion afterwards.

—Philip R. Freeman

Grand River Valley Records Field Day

Some 150 members and friends of the Grand River Valley chapter participated in a successful field day on September 18 at the Waterloo Rod and Gun Club despite an unscheduled rainstorm in the afternoon.

Contestants vied for honors in horseshoe pitching, and "giddy golf." Prizes were awarded by Chairman Jack Ward, assisted by Joe Strike, second vice chairman and Clayton Henderson, third vice chairman. First Vice Chairman Percy Barber was head chef and had a big staff of volunteers.

On September 11 the chapter held its regular meeting in Galt, Ont. The speaker of the evening was George Beaumont, electrical engineer at Westinghouse, Ltd., Hamilton, Ont. Mr. Beaumont talked on "Telecommunications and Advantages of Printed Wiring." Educational Committee Chairman Victor Mitchell awarded *Tool Engineers Handbooks* to three deserving technical high school students. Recipients of the books were Dennis Hilkes of Waterloo, Gary Lawse of Guelph, and Paul Sczimtimry of Galt.

—W. C. Little

Northern Massachusett's industrial education meeting drew a crowd of 300 including a contingent of national ASTE officers. From left: Glen H. Stimson, chapter chairman; Roger F. Waindle, national ASTE president; Joseph P. Crosby, first vice president; and Richard A. Smith, a national director, in the front row. Looking over their shoulders are Cletus V. Briner and Ray H. Morris, both past national presidents of ASTE.

Industrialists and Educators Confer on Engineer Shortage at Special Meeting

Athol, Mass. — About 300 ASTE members, industrialists and educators of north-central Massachusetts turned out for the industrial education meeting held by the Northern Massachusetts chapter in Memorial Hall on September 15. The keynote of the series of addresses during the evening was the necessary cooperation of industry and education in encouraging young men to choose engineering as a career. The shortage of 20,000 engineers in industry was cited.

Dr. G. Roy Fugal was the featured speaker of the evening. He is manager of employment practices at General Electric Co., New York. His topic, "How Industry and Education Can Cooperate in Achieving Common Goals," emphasized that no one has the whole answer to the problem at hand and each community must work out its own solution in its own way.

Dr. Fugal pointed out that the school cannot do it alone and needs all possible assistance from industry. He recommended the holding of "career days" in the schools.

A seven-point program was outlined by Chairman Glen H. Stimson which listed the periodical visitation to schools by members of the chapter so they could speak to the students on opportunities in the field.

Other speakers were: Roger F. Waindle, national president of ASTE; John Englested, works manager of the Union Twist Drill Co.; Principal George Wrightson of Turners Falls High School; John F. Shea, assistant state director of vocational education; and Dr. John J. Desmond, Jr., commissioner of education.

Special guests of the evening were Ray Morris of N. Canton, Conn., and Cletus V. Briner, Wickliffe, Ohio, both past presidents of ASTE.

—Leslie H. Laughton

Annual Outing Held

Toledo—The annual outing of the Toledo chapter was held at the Central Avenue Golf Course for record-breaking crowd of 308. Charles Couturier was program chairman. Adam Gilles won a deep freeze for his skillful golf game.

—James F. Sullivan

Steel Company Official Presents Racine Program

Racine—Nearly 100 members turned out for the September dinner meeting of the Racine chapter at Dania Hall on September 14. Highlight of the evening was a talk by A. J. Scheid, vice president in charge of metallurgy, Columbia Tool Steel Co., Chicago Heights, Ill. He addressed the group on "Making Good Tool Steels Perform Better."

The talk covered three phases of today's tool steels: What's new in production, the latest in grade types and variations, and the modifying of treatment procedures to meet operating conditions. The talk was followed by a movie "Manufacture of Tool Steel" and a discussion period.

—Charles Nelson

Marshall Blu Dies in Florida Hospital

Marshall A. Blu, a consulting engineer at Fort Lauderdale, Fla., and one of ASTE's most prominent members, died in a Miami hospital on August 19 after being stricken the same day in Miami. He was 56.

Before going to Florida in February, 1952, Mr. Blu had been associated for 17 years with Sears, Roebuck & Co., where he was in charge of production engineering. He formerly had been a tool engineer at Pontiac and Buick Divisions of General Motors Corp. and at Packard Motor Co. A one-time instructor on the staff of Purdue University, he was affiliated with the Army Ordnance Corps in Washington, D. C. from 1942 to 1945.

Marshall A. Blu

Mr. Blu was a past chairman of the Chicago ASTE chapter and show chairman for the Society's 1952 Annual Meeting and Industrial Exposition held in Chicago. In recognition of his service to ASTE, the Chicago chapter established the Marshall Blu Scholarship Fund in 1952.

Ladies Night Opens Kansas City Meetings

Kansas City, Mo.—An audience of 210 members and their guests heard a talk on the work of the Federal Bureau of Investigation at the annual ladies' night meeting of the Kansas City chapter held September 2 at Roselli's Restaurant. Program speaker was Harry G. Maynard, FBI agent with the Kansas City office. He showed a film and later described many of the difficult cases which have confronted the FBI.

On August 9 the chapter members, their families and friends met at Lake Quivira for the annual ASTE picnic. A full program of outdoor activities was enjoyed by the 200 who attended. Serving on the arrangements committee were: Robert Brown, Ivan Nelson, Merlin Grundy, Winton Jensen, Gary Schroer, Hank Choquette and Harry Green.

—Richard W. Corliss

James J. Mudd, mid-west regional sales manager, The Bellows Co., Akron, spoke on "Controlled Air Power as an Aid to Faster, Safer and Better Production" at a Kansas City meeting. From left: Roy Griffin, Mr. Mudd, and W. D. Jenson.

Long Island Supplements Regular Meeting with Monthly Panel Discussion Programs

Farmingdale, N. Y.—Long Island chapter presented the first in a series of panel discussions on September 28 at Long Island Agricultural & Technical Institute. The panel discussion on optical tooling met with such overwhelming success, the executive committee decided to continue them in addition to the regular monthly meetings. The discussion was planned for an expected audience of 20 members; nearly four times that number attended.

Panel members included Richard Stegler and John Borner, both manufacturing research and development engineers, at Republic Aviation Corp., Farmingdale; Jack Steel, project engineer on optical tooling, Farrand Optical Co., New York, N. Y.; Merrit Potter, foreman tool and die department, Grumman Aircraft Engineering Corp., Bethpage, N. Y.; E. J. Schneider, vice president and secretary of Engis Equipment Co., Chicago; Ward Boulter, manager, Branch House Department, Keuffel & Esser Co., N. Y.; and Moderator Harold Poett, optical tooling engineer, G.A.E.C., Bethpage, N. Y.

John Borner gave an introduction to optical tooling followed by Richard Stegler who spoke on how to design tools for optical tooling. Jack Steel discussed optical squares, Merrit Potter gave his opinion on how jig-shop personnel like optical tooling, and E. J. Schneider spoke on the difference between auto-collimation and auto reflection. Ward Boulter concluded the discussion with a short dissertation on optical tooling equipment in general and questions from the floor were answered.

On September 14, the first regular monthly meeting of the season was held at the Garden City Hotel. Speaker of the evening was Ernest Schultz, production manager, Russell Reinforced Plastics Corp., Lindenhurst, N. Y. His topic, "Plastics in Industry," covered fabrication of tools. —*Sara T. Moxley*

Photographic Production Problems Discussed

Manitowoc, Wis. — Oldtimers' Night was held at Reef's Mills by the Fond du Lac chapter on September 10. Over 90 members and guests heard a talk by J. H. Calder, vice president and sales manager, The David White Co.

Mr. Calder's topic was "Three Dimensional Photography." It covered the development and production problems involved in making the stereo-realist camera, viewer, and projector. Various problems of developing newer cameras and projectors were also explained. The talk was illustrated by three-dimensional slides. —*R. M. Hanson*

First Portland Session Features Power Brushing

Portland, Me.—A technical sess followed dinner and a business sess at the first regular meeting of the Po land chapter at the Columbia Ho Portland, on September 11.

Paige Meade, of the Osborn Mfg. C Cleveland, demonstrated by slides t various uses of power brushing to r move burrs and sharp edges from gear threads, grinders, and rotary tables.

The officers mixed business wi pleasure at a special executive boar meeting held at Chairman Faye Taylor's seaside home on September Programs for the coming meetings wer under discussion. —*Henry C. Hagma*

Chemistry's Role in Industry Reviewed

Milwaukee—"Science, Industry and Your Future" was the topic of the talk given at Milwaukee's ASTE meeting by Paul R. Leach, mid-west manager, Extention Div., E. I. Du Pont de Nemours and Co. Seventy-six members gathered at American-Serb Memorial Hall for the event.

Mr. Leach discussed the important human factors which motivate our industrial way of life, hitting on relationships between "big" and "little" business, the power of the consumer, and the value of research. He gave a preview of some products of chemistry, just out of the laboratory and not yet in production. —*Walter Behrend*

New Haven Member A. T. Morton proudly shows off the 40-pound bass he caught last summer. This photograph, although not considered official ASTE business, caused much comment at the chapter's September business meeting held at Colonial House in Hamden.

Large Audience Hears

Pantography Topic

aginaw Valley chapter members heard three speakers on engineering registration t their September meeting. From left to right: Chapter Chairman Don McMillan shown with Howard Roat, chairman of the Professional Engineering Committee; Henry Groehn, executive secretary of the Michigan State Board of Registration; nd Wesley Trathen, professor at General Motors Institute.

Obituaries

Thomas F. Githens, rated among first-rankers in the field of machine design, and a member of the Cleveland ASTE chapter, died recently at the age of 64.

For the last 35 years, Mr. Githens had been mechanical engineer for the Cleveland Twist Drill Co. in charge of the machine design division. Vice-president of the Cleveland Engineering Society in 1952, Mr. Githens was an honorary life member of the ASME and chairman of its machine design division.

Crandall Inskeep, a member of the Indianapolis chapter for many years, died at his home on September 27. He was 57. He had been associated with the George O. Desautels Co. in Indianapolis as a sales and service engineer.

Richard Watson, 54, Indianapolis ASTE member, died at his home on September 6. A member of the Detroit chapter before transferring five years ago, Mr. Watson had been a methods engineer at Mouldings, Inc. before starting his own engineering service.

Named Sales Manager

According to a recent announcement, Rudolph A. Laakso has been appointed to sales engineer in the Worcester area for Johnson de Vou, Inc., Worcester. Mr. Laakso, a member of the Boston chapter, was formerly with Simons Abrasive Co.

Industrial Relations Topic of J. S. Metcalfe

Nashville—"Industrial Relations as Applied to the Tool Engineer" was the topic of a talk given at the September 15 meeting of the Nashville chapter by James S. Metcalfe, director of public relations, Crosley Div. of the Avco Mfg. Corp., Nashville.

W. A. Thornberry, chapter chairman, was awarded the *Tool Engineers Handbook* which he won for submitting a winning question at one of the panel discussions of the 21st Annual Meeting.

Special guests at the session were R. O. Rollins, tool designer at Hermitage Stamping Co.; W. R. Smith, partner in Mid-South Tool and Die Co.; and Lawrence Wirth of the Evansville, Indiana, chapter.

—Judkins Wilkinson

Society Official Visits Binghamton

Binghamton—A varied program was scheduled for the first meeting held by Binghamton chapter on September 2 at the Vestal American Legion Hall.

A short business meeting was conducted by Howard D. Bertholf, chapter chairman. David O. Williams, first vice chairman, then introduced a guest, James Urquehart of National Cash Register Co., Dundee, Scotland, who is visiting this country for several months to study tool engineering.

A surprise visit by Allan Ray Putnam, assistant executive secretary of ASTE from national headquarters proved interesting. He extended good wishes from headquarters and addressed the group on broad future plans for the Society.

A movie of the United States from coast to coast was projected and narnated by Dr. Ketchum, of Harper College, Endicott, N.Y., who had taken the movies personally. *—Charles L. King*

Joseph Karash Heard at Indianapolis Meeting

Indianapolis—Speaker at the September technical session of the Indianapolis chapter was Joseph I. Karash of the Reliance Electric and Engineering Co. in Cleveland. He spoke to an audience of nearly 100 members and guests at the Sahara Grotto.

The topic of his talk was "Die Design for Inclinable Punch Presses." Covering the advantages of inclining a punch press at full 45 degrees, Mr. Karash listed natural part removal, scrap removal, better vision, working angle, and safety. *—M. B. Rosenbarger*

The Indianapolis September meeting featured a talk by Joseph I. Karash, production superintendent of the Reliance Electric Co. Shown seated, from left, are: Don Stroud; Joe Penn, chairman; Mr. Karash; and Joseph Enright, first vice chairman. Standing: Don Steel, associate editor; Roy Erickson, program chairman; Lloyd Turner, treasurer; and Leo Feeney, in charge of entertainment.

Large Audience Hears Dr. Roy K. Marshall

Rochester—A record crowd of 425 turned out to hear Dr. Roy K. Marshall, eminent technical speaker and television lecturer, for the first meeting of Rochester's technical season on September 14, held at the Seneca Hotel.

In his talk entitled "Stars, Atoms and Man," Dr. Marshall said that man holds in his brain the power to explore the vast universe through the use of simple laws of physics and mathematics, but added that man is often prone to error in his theories.

He continued in a serious tone, cautioning man, the dispenser of the electron and atomic power, to stop in his selfish quest for power and to do good with this knowledge. He warned that men must make the decision for themselves either to live together or to die together.

—Paul Bruno

Dr. Roy K. Marshall receives one of the first Taylor barometers as a token of appreciation for his talk "Stars, Atoms and Man" from Rochester Chapter Chairman Donald Kohler.

Houston Tour Draws Attendance of 200

Houston—Over 200 members and their guests of Houston's ASTE chapter toured W-K-M Co., an oil tool manufacturer, on September 8. The tour included operations, production, and machines which produce large valves and oil-well head equipment. The Society visitors were particularly interested to learn that it is the only plant in Houston with machine tools in operation on the second floor.

—M. M. Wiseman

Pantography Topic of Evansville Program

Evansville—Two speakers were featured at the September meeting of Evansville chapter held at Smitty's Steak and Sea Food House. Nearly 150 members and guests turned out. The main speaker was A. D. Gunderson, chief tool engineer, Geo. Gorton Machine Co., Racine, Wis.

His topic, "Pantography in Industry Today," was illustrated by slides and a colored film entitled "The Pantograph in Operation." Mr. Gunderson passed samples of the intricate work among the audience.

The coffee speaker for the evening was Jesse Fine, owner of the new Evansville television station. He told his ASTE audience what to expect from their new station, the first Evansville has had. The program chairman of the evening was Herman Muehlbauer.

—Bill Gaines

Ladies' Night Opens Fort Wayne Meetings

Fort Wayne—Two "firsts" were recorded for the Fort Wayne chapter on September 9. It was their first meeting of the regular season and their first "Ladies' Night." The scene of operations was the Fort Wayne Chamber of Commerce Building.

Donald Welbaum, chapter chairman, introduced the officers and committee chairman, welcomed members, guests and ladies, and briefly explained the duties of a tool engineer.

Walter McBride, director of Fort Wayne Art School, was the main speaker. He explained the influence of the art school in Fort Wayne, the type of art explained at the school, and showed many examples of art work. Mrs. Arthur Hudson and Mrs. Everett Keese won attractive flower baskets as attendance prizes.

—Richard Spaw

Charles Bazaz Receives Paterson Award Pin

Paterson, N. J.—As a highlight of the September meeting of Paterson's ASTE chapter, Chairman Charles Bazaz was honored with the annual chapter chairman's award pin in recognition of his outstanding service and fine record in securing new members. The pin will be mounted and displayed in the club rooms at each monthly meeting. Selection of Mr. Bazaz as recipient of the award was unanimous on the part of the chapter.

E. H. Neese Discusses Paper-Making Machinery

Rockford—A technical program on "Paper-Making Machinery" was featured at Rockford ASTE chapter's September meeting held at the Lafayette Hotel. The talk was presented by E. H. Neese, Jr., assistant to the vice president in charge of operations at the Beloit (Wis.) Iron Works. Supplementing Mr. Neese's discussion were slides showing the various steps in paper making.

The ASTE audience of more than 85 members also saw a color film taken at the chapter's annual outing last June.

—Peter J. Cassaro

Rockford's executive committee discusses plans for the coming year. Pictured, left to right, are: Alfred Oman, second vice chairman; Nels Balestri, constitutional by-laws chairman; Ernst Norman, secretary; William Moreland, chairman; Walter Fraser, treasurer; Marshall Samuelson, program chairman; and Lawrence Geiger, membership chairman.

Westinghouse Toured by Hamilton Chapter

Hamilton—A tour of Canadian Westinghouse Co. was in order for the Hamilton chapter on September 11. More than 125 members and guests were welcomed by Ernie Porthouse, supervisor of tooling, and introduced to the tour guides.

Groups viewed the development laboratory, where Harry Thomasson, manager of the metallurgical section of research and development, was on hand to introduce them to the different departments such as microphotograph, strength of materials, mechanical testing, induction heating, and various phases of electric and gas welding and its application.

The tour also included heavy machine work, automatic machine, press, welding and toolroom departments.

—John Litwin

Magazine Editor Stresses Value of Machine Tools

Lima, Ohio—An informal word picture of how machine tools are responsible for the jobs we hold and the comforts we enjoy was painted by H. E. Linsley, associate editor of *American Machinist*, at Lima chapter's September meeting. His discussion was heard by more than 70 members and guests at a dinner session held in the Royal Pine room.

Speaking on "Machine Tools Create Jobs," Mr. Linsley said using machine tools to build automobiles had destroyed 200,000 jobs, such as harness makers, blacksmiths, teamsters and wheelwrights. He also reminded his listeners that these same machine tools have been responsible for the creation of over six million new jobs.

Following the technical meeting, a film on bowling was shown. Guests present included William Eisenhauser, Phil Martsof, Chet Parks and Robert Barnett. Three new members were introduced—L. Ansley, Dick Premo and Clem Davis.

—Donald Cox

Tom Donovan Conducts Famed Technical Quiz

Toronto—Thomas J. Donovan, Jr., past national director of ASTE, conducted his well-known "Technical Quiz Program" for members of the Toronto chapter at Union station on September 9. Silver dollars were awarded the ones who knew the answers.

Several out-of-town guests were on hand to participate. They were: G. A. Gareau, chairman of the Montreal chapter; Dave Dawson of the Windsor chapter; Mr. Henley, treasurer of Grand River Valley; and T. Angrum of Montreal.

—A. McKinney Rice

Vice President Talks on Turning Developments

St. Charles, Ill.—The first fall meeting of the Fox River Valley chapter of ASTE was held September 15 at the Baker Hotel. A group of 75 members and guests attended the dinner session and heard a talk by S. A. Brandenburg, vice president in charge of sales for Monarch Machine Tool Co. He spoke on the latest developments in the turning field.

The coffee speaker was Stuart Pritchard who gave an informal discussion and showed films on a recent fishing trip in South America.

—W. C. Perkins

In August, Roger F. Waindle, national president of ASTE, entertained four Denver chapter officers at the Denver Athletic Club. Left to right are: George Buckle, secretary; Mr. Waindle; Clyde P. Elliot, program chairman; Norval Allen, second vice chairman; and Willard Krieger, first vice chairman.

Tri-Cities Members Open Season with Panel Discussion on "Plastics in Tooling"

A panel discussion on "Plastics in Tooling launched the 1953-54 season for the Tri-Cities chapter of ASTE. Four experts covered the various phases of the subject for an audience of over 100 member and guests at the September 9 meeting.

George Hammond, manager of the automotives sales division of Owens-Corning Fiberglass Co., introduced the program with a talk and a color film on "Fiberglass."

The first speaker introduced by Mr. Hammond was Wallace A. Stanley, representative for Creative Industries of Detroit. After a brief resume of the types of plastics used in tooling, and their advantages, Mr. Stanley said the use of plastics in dies saves about 50 percent of the machining cost through the reduction of machining time.

Plastic dies can be easily duplicated and repairs made quickly, he said. Plastics can be used in conjunction with steel, but a corrosion-resistant layer must be used between the two materials.

Mr. Stanley concluded his lecture with pictures illustrating plastic-forming dies and 3-D color slides on plastic tooling.

Additional 3-D slides were shown by Dale Knepp of Kish Industries, Lansing, Mich. His topic was "Automotive and Aircraft Tooling." The use of plastics in the manufacture of the F-86 Sabre Jet was discussed by C. Sircitini, general foreman of the production plastics department for North American Aircraft, Columbus, Ohio. He illustrated his lecture with slides showing the application of plastic tooling at North American.

At the informal discussion period which followed the panel, the speakers were joined by James L. Brown and Shepherd Sikes, sales representatives for Owen-Corning Fiberglass Co., and William Gold, plant manager for Creative Industries. *—Earl Tenpound*

Verne Warne Heard by San Diego Members

San Diego—The September meeting of San Diego chapter at El Morocco, featured a talk by Verne J. Warne, senior field engineer, Minneapolis-Honeywell Regulator Co., Freeport, Ill. As illustrative material, Mr. Warne showed the film, "Micro-Switches—Uses Unlimited," and passed sample switches around in the audience.

—William Keller

Ben Hazewinkel Speaks on Future Plans of ASTE

Denver—Coffee speaker at the September meeting of the Denver chapter was Ben J. Hazewinkel, a national director of ASTE and chairman of the Denver chapter from 1947 to 1949. He discussed national aims and programs of the Society.

The technical portion of the dinner meeting was devoted to a discussion of heat treatment of tools. It was presented by Floyd R. Anderson, chief metallurgist at the Gardner-Denver Co., who illustrated his talk with slides. He gave examples of tool failures attributed to heat treating when other factors were really to blame. *—James M. Johnson*

Keene Members Tour American Optical Co.

The Keene, N.H., ASTE group affiliated with the Twin States chapter, visited the American Optical Co. on September 24 for a plant tour and technical session on optical measuring instruments. Some 75 members observed the manufacturing of lenses from rough billets through various stages to the completed lens. They also heard a talk by Gilbert Pride, plant physicist. Mr. Pride explained the three classes of measuring methods—size, distance and displacement. He discussed the specific instruments of each class, explaining their particular uses. *—D. J. Brown*

North Texas Provides $500 for Scholarship

Grand Prairie, Tex.—The executive committee of the North Texas chapter met at the Lennox Hotel on September 28 to set aside $500 for a scholarship to some deserving area student for a course in tool engineering at a school of his own choice. They also drafted plans to encourage industry in the area to join them in the endeavor to promote other scholarships to induce young men to select tool engineering as lifework.

On September 15, more than 300 members and guests of the North Texas chapter attended an annual "get-together" at the Sky Club in Dallas.

—F. Paul Simpson

Members of the Springfield, Ill., chapter, heard J. Gordon Seiter, of F. J. Stolkes Machine Co., Philadalphia, Pa., talk on "Vacuum Metalizing Today." Shown are Mr. Seiter, left, and Robert C. Peek. Earl T. Kane took the picture. ***—Charles Collier***

Joe Penn Elected Head of Indiana Chapter Council

Indianapolis—Officers and committeemen of the Indiana ASTE chapters got together on September 19 for the second meeting of the Indiana ASTE Chapter Council. Officers were elected to serve until March 1954 and plans were discussed for next year's tool engineering conference at Purdue University. Joe Penn was named chairman; Paul Vierling, first vice chairman; Donald Welbaum, second vice chairman; and Joseph Enright, secretary-treasurer. *—M. B. Rosenbarger*

Watermelons seem to be a major attraction for these Springfield, Mass., chapter members at their annual outing. From left, first row, they are: Wendell T. Ingham, chairman of the constitution and by-laws committee; Walter S. Kuczek, educational committee chairman; Jack LaHotan; Robert Dickson, chairman; and Dick Dow. In the second row are: Wallace Metcalf; Gay Knapp; Hollis B. Moore, second vice chairman; and Dwayne W. Charron. The back row faces belong to Bob Langdon; Ken Blaisdel, public relations chairman; Fred Wilcox, membership chairman; Jack Naylor; George Carlson; Edward Stark; Edward T. Curran, treasurer; and C. H. Stonerod. ***Edward M. Stark***

Tooling for Production Reviewed by Harry Conn

Philadelphia—Harry Conn, chief engineer of Scully Jones & Co., Chicago, was the technical speaker at the fall meeting of the Philadelphia chapter. His discussion was devoted to "Tooling for Production."

Speaking at the Engineers' Club on September 17, Mr. Conn used slides to portray examples of unusual but practical tool applications, including drills, reamers, multiple drills and tapping equipment in the automotive and other metalworking industries.

An especially interesting portion of his talk concerned the debunking of the long established 75-percent depth of thread tables appearing in virtually all handbooks. Mr. Conn said this has been outmoded by recently developed practices and will be supplanted in the future by the reduced percentages of thread.

He explained that in tapping tougher metals, which are naturally hard to tap, it is possible to reduce the percentage of thread drastically and still exceed the strength of the bolt. Charts were distributed to members showing tabulation of tapdrills to achieve percentages of thread ranging from 57 percent to 72 percent for hard and softer metals. The advantages of smaller percentage threads are shorter tapping time, reduced tool breakage and longer tool life. *—Jack Schroth*

Erie Views Production of Sterilizing Equipment

Erie—Members and guests of the Erie chapter toured the American Sterilizer Co. in Erie during September. The tour was under the direction of S. J. Hickel, plant supervisor, assisted by E. H. Davis and H. Harrity of the wage incentive engineering Dept. The group witnessed the manufacture of hospital sterilizing equipment from start to finish including the foundry, engineering and machine departments, sheet metal shop, and finish and assembly departments. *—H. W. Sedler*

Clambake Highlights Twin States' Activities

Springfield, Vt.—More than 175 members and guests attended the Twin States chapter's annual clambake at Crown Point Country Club on September 19. Athletic contests including golf, horseshoes, softball, and putting rounded out the day.

—Maurice E. Blais

anta Clara Sets Up etal Stamping Course

Santa Clara Valley chapter announces e establishment of a ten-week course metal stamping, to be conducted as extension service of San Jose State ollege. The instructor of the course ill be Frank Menard, owner of Menard fg. Co., Redwood, Calif., and also anta Clara Valley's membership chair-an.

The course will include a study in the ypes, sizes, and uses of power presses; esign and operation of dies for blank-ng, forming, bending, drawing, and orging; and characteristics of various ie materials, and automatic feeding evices. The course was arranged by Carl F. Kaiser, educational chairman f the chapter.

On September 15, K. R. Blake, tech-ical director of Metalloid Corp., Hunt-ington, Ind., addressed the group on "Proper Procedure of Production and Toolroom Grinding," a technical session on modified tool geometry. Joseph Fletcher and Flo Vite, both of Golden Gate chapter, were visitors at the event held at DeAnza Hotel in San Jose.

—Glenn Herreman

Sponsors Classes at Tulsa University

Tulsa—The September meeting of the Tulsa chapter was devoted to a presentation of the tool engineering course that has been set up with the aid of an education committee under the direction of O. C. Jones, chairman. E. A. Schrodeck, member of the committee, addressed the chapter on the progress made and objectives for the future.

The program is on the high school and college level and has as its theme "Hearing, Seeing and Doing Tool Engineering Work."

The courses, as presently set up at Tulsa University, stress use of the Tool Engnineers Handbook and and instructors will be men who are actually employed in industry. The 16-week course will be presented in three phases—lecture by an authority on the subject, films related to the subject, and free-hand sketching of related design problems.

Introduction to tool steels, heat treat technique, time study, and fundamentals of cintered carbides are a few of the offered classes.

Paralleling the college course is an elementary shop math course which has been set up at Will Rogers High School under the sponsorship of the Tulsa chapter.

—E. A. Schrodeck

William Lanyon, Santa Clara chapter chairman, and Speaker Kenneth R. Blake, technical director of Metalliod Corp., are shown at the September 15 technical session held in San Jose.

Ladies' Night on Hartford Schedule

Hartford—The special executive meeting of the Hartford chapter was held at Grant Smedley's farm on September 12, featuring an old-fashioned clambake. Volleyball, softball, and horseshoes occupied those attending.

Present were: Omer Gingrass, Harry Anderson, Henry Gotta, Albert Landry, Clayton Parsons, Ray Morse, Newton Alvord, Luther Murphy, Fred Fippinger, Ernest Osterling, Jesse George, Michael Elin, Herbert Richardson, Henty Kuryla, Arnold Lormore, Howard Wheeler, Joseph Balciunas and Grant Smedley.

"Ladies' Night" was held on September 19 at the Avon Country Club to the theme of "Mardi Gras." It was the largest attendance for such an affair in Hartford's history. All ladies present received a gift. *—A. Douglas Proctor*

Roger Waindle Discusses Education Aims of ASTE

Peoria—ASTE's national president, Roger F. Waindle, was a special guest at the September meeting of the Peoria chapter, where he spoke to an audience of over 125 members.

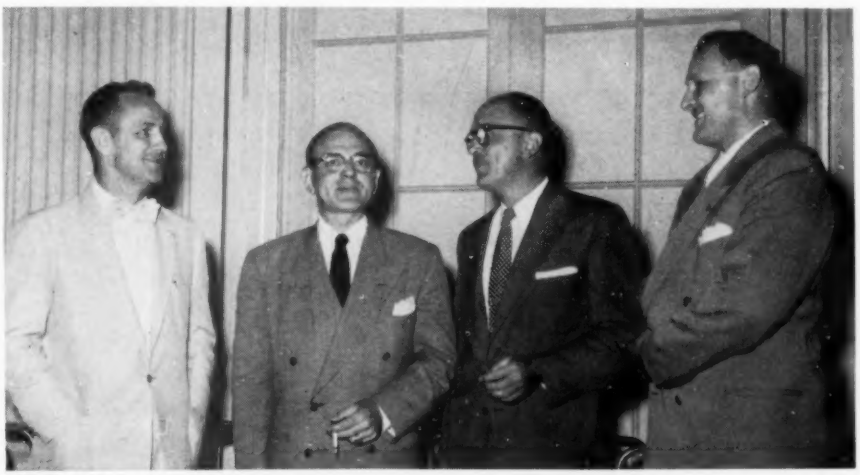
In his coffee talk, President Waindle explained that the main purpose of the American Society of Tool Engineers is to educate and inform. He said that over a five-year period it is possible for members to participate in over 300 short technical courses by reading THE TOOL ENGINEER, attending chapter meetings and national meetings of the Society.

The technical program was introduced by Harold Schafer who was technical chairman for the evening. The speaker was Emery B. Kerekes, assistant to the vice president of the Loewy Construction Co., New York. He discussed problems in designing and building a 50,000-ton press. Slides were shown of press designs made in Germany shortly after the first world war and also of the 50,000-ton press constructed by the Loewy Co.

Among the new members welcomed by the Peoria chapter during the past several months are Donald Cox, James Gaw, Nathaniel Granada, Robert Smith, Virgil Sprague, Harold Lohnes, Erwin Miller, William Woodrow, Max Turner, Donald Rhineholz, and Charles Tyler. *—Russ Saurs*

Named President

An announcement has been made of the election of Frank S. Speicher, Jr., to the offices of president and treasurer of the M. E. Cunningham Co., Pittsburgh. The Pittsburgh ASTE chapter member was formerly secretary and treasurer of the company.



Roger F. Waindle, national ASTE president, was coffee speaker at the September meeting of Peoria chapter. Seen here discussing the event of the evening are: Harold Schafer, technical chairman; E. B. Kerekes, speaker for the session; Mr. Waindle; and Raymond Zimmerman, chapter chairman.

Two staff members from the Indian Standards Institution visited ASTE headquarters on a recent tour of the United States. Pictured here getting a preview of plans for the *Die Handbook*, from left, are: P. D. Harvey, assistant technical director; C. T. Burke, ASTE National Standards Committee secretary; Maharash Kishen and S. K. Sen; and J. M. Holt, assistant editor of the book.

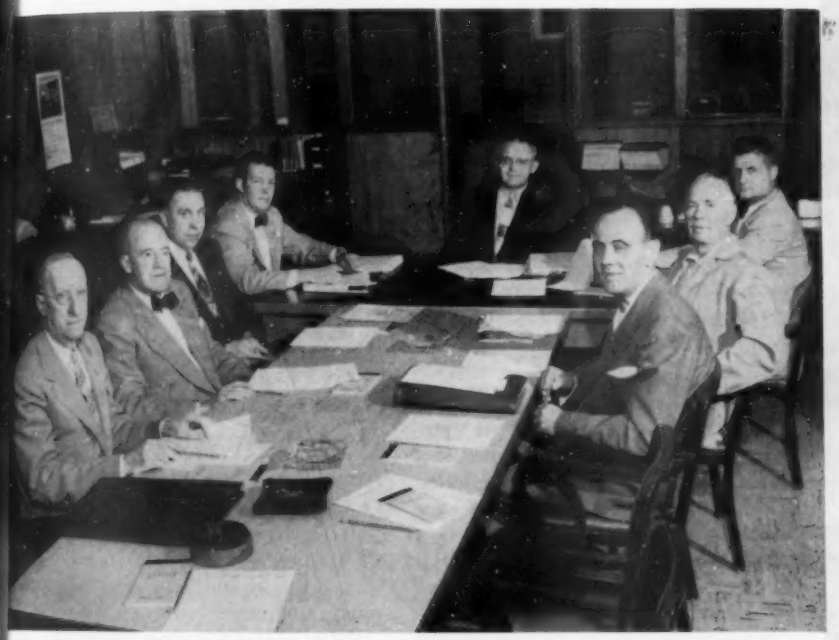
Committee Meetings Dominate National Headquarters Agenda

Attending the autumn session of the National Constitution and By-Laws Committee, held in Boston, were: Marvin Bunting, secretary of the committee; John X. Ryneska, chairman; and Edward J. Berry and Vincent M. Spahr, committee members.

Members of the Annual Nominating Committee for Directors who met recently to prepare their annual report were, from left: Ralph Baker, G. B. Berlien, Past President J. J. Demuth and W. A. Thomas. The results of their work will be published in the December issue of *The Tool Engineer*.

Greater Lancaster Sla

their meeting held on September 12, National Editorial committee members were joined by Joseph P. Crosby, first vice president of the Society; Allan Ray Putnam, assistant executive secretary; and members of the editorial staff of *The Tool Engineer* magazine. Joseph L. Petz is committee chairman.



Members of the National Professional Engineering Committee also met Sept. 12 at National headquarters. From left: Howard W. Gross, William A. Dawson, Leslie C. Seagor, C. T. Burke, secretary of the committee, Prof. L. E. Doyle, chairman of the committee, Hugo L. Aglietti, Clyde T. Mooney, and Herbert G. Heinmann.

Shown at the National Finance Committee meeting, from left, are: Daniel B. Wesson, President; Roger F. Waindle, Assistant Executive Secretary Allan Ray Putnam, Chairman H. Dale Long, Executive Secretary Harry E. Conrad, Duane Brighton, Accountant Harry Anderson. Fred Kampmeier, Frank J. Hausfeld, Jr., and Assistant Secretary-Treasurer Wayne Ewing.

Greater Lancaster members toured Tapco Div., of Thompson Products on September 8. Shown after dinner are: seated, Lester Eastman, first vice chairman; Raymond C. Moorhead, chairman; W. H. Goldbach, works industrial engineer, and W. S. Johnson, works manager, both speakers of the evening. Standing: John R. Folkeson, secretary; J. H. Resser, Sr., delegate; W. M. Hovok, alternate delegate; M. M. Sensenich, treasurer; and R. C. Ressler, 2nd vice chairman.

No Rest for Mid-Hudson Committees; Summer Record Shows Rise in Membership

Poughkeepsie, N. Y.—A ten-percent increase in membership of the Mid-Hudson chapter resulted during the summer recess when 27 applications were processed by the executive committee. News from other Mid-Hudson committees indicates that they also were busy during the vacation months.

Through the efforts of the professional engineering and education committee members, a basic engineering course was set up to prepare participants for the New York State Professional Engineering License examination.

Under the chairmanship of L. H. Tenney and C. Morgan Newbury, in conjunction with the Arlington Adult Education program, a curriculum was formulated, teachers were obtained and class sessions were begun on September 9.

Classes Prove Popularity

Two class groups of thirty each were planned originally. However, interest was so great that a third class was required and inaugurated on September 23. The course will extend over a period of three years with classes held one night a week.

Also under the sponsorship of the education committee are the cash awards made to the senior students graduating with the highest grades in physics from the city's high schools. It is planned to make this an annual program.

Meetings lined up by the program committee will list speakers on such topics as design and use of cutting tools, atomic energy, management relations, army ordnance engineering, general tool designing, and quality control.

Data Sheets in Preparation

The standards committee is preparing data sheets on information not found in handbooks. On completion the sheets will be forwarded to national headquarters for review.

Changes in the format of the Mid-Hudson monthly meeting notice have been studied by Edward Phalen, co-chairman of the finance committee, and Edward Nielson to improve the layout and provide additional advertising space.

—S. P. Cook

Greater Lancaster Slates Education Night Program

Lancaster, Pa.—One of the year's most important meetings plannd by the Greater Lancaster chapter will take place on November 10 when the group holds its Education Night. The program will get under way at 6:45 p.m. at the Armstrong Cork Co.

Arthur Diamond, chairman of ASTE's National Education Committee, and K. W. Riddle, chairman of the National Program Committee, will take charge of the meeting. Also participating will be other members of the National Education Committee as well as principals and manual arts teachers from local high schools, professors and instructors from colleges in the area and officers and committee members from neighboring ASTE chapters.

On September 8, Greater Lancaster members met at Tapco Div., Thompson Products, Inc., in Harrisburg for a tour of the new plant where parts for jet engines are manufactured. A discussion of the firm's history and growth was presented by W. H. Goldbach, works industrial engineer, and W. S. Johnson, works manager. Also as part of the program, the 96 ASTE members and their guests saw a new film titled "The Jet Story."

—George Gallagher

Mark Hodapp Talks to Elmira Audience

Elmira, N. Y.—Members of the Elmira chapter mixed business with pleasure during their September meeting at the Mark Twain Hotel. Following a 6 p.m. business conference, members and guests enjoyed the social activities of an indoor clambake and Mark Hodapp, field engineer, Electric Controller Co., Syracuse, N. Y., spoke to the group.

—John D. Graham

John C. Lindblad, center, of S. C. Johnson & Sons, Inc., was the program speaker at a recent Tucson ASTE meeting. Pictured with him are Chairman James Beach, left, and Robert Ayers, program chairman.

Power Plant Visited by Salt Lake Chapter

Salt Lake City—Members of the Salt Lake City chapter visited the Gadsby Power Plant on September 11. Preceding the tour, they were briefed on the power company's system of operations and influence.

Power company engineers and executives acted as guides. The plant boasts being "completely automatic," in that only a skeleton crew is on hand to keep tab on the plants myriad of gages and dials. The power plant serves three-fourths of Utah residents.

Special guest of the evening was Ben J. Hazewinkel, a national director of ASTE, who outlined immediate objectives of the Society.

On August 22, the Salt Lake City chapter held its annual family picnic at Mill Creek Canyon where volley ball and horseshoes were the main activities of the day. Earlier in August, members held their annual party. Surprise guest was Roger F. Waindle, president of ASTE, who was vacationing in the West. He was entertained by Prof. Frederick Preator and Past Chairman Leslie Seager.

—Reid L. Rice

Fred Maurice Addresses Albuquerque Engineers

Albuquerque — The first regular dinner meeting of the 1953-54 season was held on September 21 at Leonard's Restaurant and members of most of the major engineering societies were present to hear Fred Maurice, president of the *Societe Genevoise d'Instruments de Physique*, Geneva, Switzerland.

Mr. Maurice, recognized as one of the world's leading authorities on "line standards," spoke on "Meteorology, the Science of Precision Measurements." He outlined the advantages and disadvantages of the longitudinal comparator, using both optical and electron microscopes, as opposed to the more recent developments in the interferometric system of precision instruments.

A film was shown to illustrate the talk and a discussion followed concerning the International Meter Bar, its calibration by the *Societe Genevoise*, and the control by gaging and calibration against the Master International Unit, of all units of length as maintained by National Bureau of Standards throughout the world.

Special guests at the event were Tom Rudel, president of American SIP Corp.; J. B. Riley, sales manager, American SIP Corp.; and Ivan Wierman, sales representative for Harron, Rickard, and McCone Co.

—H. E. Anderson

Col. Howard T. Markey

"Gear Checking" Draws Large Cincinnati Crowd

Cincinnati—The opening meeting of the 1953-54 season for Cincinnati chapter was highlighted by the technical talk of Fred Bohle, manager of machine development, Illinois Tool Works.

Before some 150 members gathered at the Engineering Society of Cincinnati, Mr. Bohle revealed his views on "Gear Checking." He explained the types of errors which can be expected and why there is a need for determining the extent of such errors.

On the lighter side, an entertaining technicolor movie was shown, entitled "Fabulous Fishing in South America." Julius Steinhoff, chairman of the membership committee, introduced 21 new members, and Moler Duff, newly appointed chairman of the education committee, gave a brief resume of summer activities, which included aiding the Ohio Mechanics Institute in setting up a course in tool and die design.

—Louis H. Schumann

Suppliers' Night Held in St. Louis

St. Louis—Launching the 1953-54 season for St. Louis ASTE members was the chapter's annual Suppliers' Night, held at the Hotel DeSoto on September 3. A large attendance of 263 was recorded at the dinner meeting. Large displays were set up by 21 companies, representing the latest developments of a number of different manufacturers.

For the technical program, the chapter heard a stimulating talk by Lieut. Col. Howard T. Markey, one of the first seven jet plane pilots used in World War II, of which only two are still alive.

Col. Markey recalled his experiences in Korea where he was recalled for 21 months of active duty in August, 1950. He discussed his work as deputy commander of the 315th Air Division which controlled the air lift in the Far East, including a passenger air line, a cargo supply operation, paratroop operations, a parachute cargo supply operation, evacuation of wounded and miscellaneous secret missions.

Communism, Col. Markey said, is not a political philosophy but a materialistic, atheistic way of life that we in America must fight by selling truth and freedom uncompromisingly 24 hours a day and by abandoning the approach of fear.

—Elmer Graser, Jr.

Williamsport Visits Carpet Manufacturer

Bloomsburg, Pa.—Sixty members of the Williamsport chapter toured the Magee Carpet Co. at their September 14 meeting. They observed the entire manufacturing operations, from the reception of raw materials to the finished product.

—John L. Balint

Posing at the speaker's platform at the September 22 meeting of the Albuquerque chapter are: left to right, Harold P. Baecker, chairman; Speaker Fred Maurice, president of *Societe Genevoise d'Instruments de Physique*, Geneva, Switzerland; H. R. Hanen, program committee chairman; and J. C. Moody, secretary of the Tucson chapter.

ASTE President Meets with Seattle Officers

Seattle—Officers of the Seattle ASTE chapter had a chance to get acquainted with Roger F. Waindle, national president of ASTE, on his recent trip to the Coast. A tour of the Boeing Airplane Co. was arranged by the officers through B. K. Bucey, tool designer-manager at the plant.

In the morning, the group toured plant number two for a view of operations in the production of the B-52.

Later in the day, John Bodner, treasurer of the chapter, accompanied Mr. Waindle on a tour of plant number one where the gas turbine assembly line is located.

Other chapter officers who hosted Mr. Waindle's visit were: Roy Coady, chairman; A. R. Jones, vice chairman; Harvey Buffum, secretary; and Clyde Peterson, past chairman.

—Carl R. F. Carlson

Industrial Safety Topic at Los Alamos Session

Los Alamos—Chapter members and guests gathered September 9 in the Little Theater of Los Alamos High School to hear C. Austin Burch of the University of California at Los Angeles.

Mr. Burch presented a program on the development of safety in industry. He started with the period time around the invention of the steam engine and progressed through to the present day.

The talk included many typical and notable accident and injury cases like the serious ones connected with the radium watch-dial workers of World War I. He concluded his talk with a film of hazardous and approved conditions in modern day shops.

—H. J. Von Steeg

Speaker Robert Poxon, left, is shown with Norman Hines, Muncie chairman, and Lester Lotz, program chairman.

Field Engineer Talks on Assembly by Hydraulics

Muncie—The Empire Room in the Delaware Hotel was chosen by Muncie's chapter as the location of the first meeting of the 1953-54 season. The dinner technical session was highlighted by a talk, "Assembly by Hydraulics," delivered by Robert Poxon, field engineer, Denison Engineering Co., Columbus, Ohio.

Mr. Poxon utilized a series of films to illustrate Denison's line of hydraulic presses as applied to various industries.

—Don C. Wedlick

Reviews Industrial Uses of Diamond Tools

Madison—Members of Madison ASTE chapter convened at Leske's Steak House on September 17 to hear Walter Meinhardt, of Meinhardt Diamond Tool Co., Chicago. He discussed the use of diamond tools in industry, explaining grades of gems, methods of selection for use, and processing of the gems. On the lighter side, he showed colored films of his own lion-hunting experiences.

—A. J. Mergen

The Seattle chapter officers arranged a tour of Boeing Airplane Co. for Roger F. Waindle, national ASTE president, when he visited them. Pictured are: Roy Coady, chairman; A. R. Jones, first vice chairman; Mr. Waindle; Dick Page; machine operator; and B. K. Bucey, tool design manager at Boeing.

Forging Method Shown to Niagara Members

St. Catharines, Ont.—The first of Niagara District's regularly scheduled meetings fell on September 3. Members gathered at Queensway Hotel to hear Dale Walcutt, sales and service engineer, National Machinery Co., Tiffin, Ohio. "Precision Forging on the Reduceroll and Maxipress" was his topic.

In forging, Mr. Walcutt, said, the flow of metal is quite unpredictable. He added that this can be controlled to some extent by using a "Reduceroll." This machine moves the metal by rolling it into the proper places so that when it is put in the "Maxipress," a part can usually be finished by a 2-3 stroke rather than 12-15 required by a conventional drop forge method. In one instance, a saving of 7½ lb of material was afforded.

He emphasized that material and labor saving is of prime importance in mass production and more and more manufacturers are turning to this process to cut costs and increase production.

—William A. Yaeger

Lehigh Valley Members Hear Robert Wiseman

Allentown, Pa.—A dinner meeting launched the fall season for the Lehigh Valley chapter. Sixty members and guests convened at Hotel Traylor to hear Robert L. Wiseman, sales manager, Microcast Div., Austenal Laboratories, Inc., New York, N. Y.

Mr. Wiseman's topic was "Microcast, A Story of Industrial Progress." Through the medium of a film he took the members step by step, through the process of manufacturing high-precision castings by the "Lost Wax Process" of ancient civilization.

Originally used to cast non-machinable alloys for dental appliances, the method was expanded to a point where today it is used whenever higher alloys are required.

—George W. Savitz

Joint Meetings Planned by Central Pennsylvania

Programs slated for future meetings of the Central Pennsylvania chapter include a number of sessions with local chapters of the American Society for Metals, the Welding Society and the American Society of Mechanical Engineers. Tours of plants in the area have also been arranged. Among them are the Landis Tool Co. in Waynesboro and George F. Motters & Sons in York.

—Paul F. Leese

Little Rhody Tours

These photographs, taken at the September meeting of the Chicago chapter, show Gordon Benes presenting the Marshall Blu Scholarship to Richard F. Wharton, a student at the University of Illinois, and the principal speakers for the evening—Edward McFerren, E. W. Dickett, National Editorial Committee member, and A. O. Schmidt, well known to the readers of *The Tool Engineer* for his many technical articles. ***—R. C. Berliner***

Industrial Uses of Nylon Discussed

South Bend—The September meeting of the South Bend chapter was held at Alby's Steak House. "Nylon vs. Metals" was the title of the talk given by A. J. Cheney, product specialist, E. I. Du Pont de Nemours & Co.

He elaborated on the use of nylon products in place of metals, illustrating his points with slides which stressed the performance and wearing capabilities of nylon. He also had a large group of nylon products which he displayed.

After Mr. Cheney's presentation, a movie was shown entitled "Flight to Future," produced by Bakelite Co. Clement Ladewski received the membership prize. *—Matthew J. Nowak*

GE Apprentices Attend San Gabriel Program

The September meeting of San Gabriel Valley chapter featured a talk by Phil Tarr, chief engineer of Kwikset Locks, Inc. of Anaheim, Calif. Mr. Tarr demonstrated and talked about powdered metal parts and their applications to a group of 115 members and 15 apprentices from General Electric. He employed a color-sound movie produced by Kwikset.

The apprentices and their director, Lou Nanchy, plan to make further visitations to ASTE technical sessions.

Chairman Peter Carter announced that through the encouragement and efforts of the chapter's vocational guidance committee, $35,000 worth of machine tools had been installed in the local high school machine tool shop.

—Peter Carter

Chautauqua-Warren, Erie Tour Ford Stamping Plant

Buffalo—Some 165 members and guests of Chautauqua-Warren chapter visited the Ford Motor Co. Buffalo Stamping Plant on September 17. Also included were a number of visitors of the Erie chapter. R. K. Bremer, of the personnel department, briefed the men on operations of the plant and cautioned them about a few safety rules to be followed throughout the tour.

The group found that this particular plant produces 40 percent of the requirements for stampings for Ford, Mercury, and Lincoln cars, including inner and outer doors, floor decks, trunk lids, front and rear fenders, and roofs.

The tour provided firsthand views of the pressrooms, die shop, maintenance shops, shipping and storage facilities, and operational offices.

—Laurence R. Green

Hydraulic Talk Heard at Tulane University

New Orleans—The first meeting of the fall season for the New Orleans ASTE chapter was held on September 9 at Tulane University.

Edward L. Asch, district manager of the Vickers, Inc. Division of the Sperry Corp., was chosen by the program chairman, Steve Emerick, to usher in the fall season with a talk entitled "Horse Sense on Hydraulic Applications."

Mr. Asch confined his talk to "power" hydraulics and presented various slides which illustrated some typical applications of hydraulics for power transmission. Included in the slides were pictures of several 1927 and 1929 automobiles in which "power steering" was first used.

Preceding the technical session, colored movies were shown of the "Marine Racing Review" and "Hunting Geese in the Marshes of Louisiana." The latter film illustrated the use of the unique "marsh buggy" for transportation over soft marshlands.

—P. A. Young, Jr.

MIT Engineer Speaks at Baltimore Program

Baltimore—Technical speaker at Baltimore chapter's September meeting was Herbert P. Grossimon, research engineer, Department of Electrical Engineering, Servo-Mechanisms Laboratory, Massachusetts Institute of Technology.

His subject, "The Numerically Controlled Milling Machine," covered machinery of the future which will tend to be even more automatic.

The coffee speaker, Ernest C. Trimble, talked about Luther Martin, an attorney general who was one of the first advocates of states' rights.

—C. G. Kelley

G. E. apprentices who sat in on the San Gabriel Valley September meeting, are shown some powdered metal parts by Phil Tarr, chief engineer of Kwikset Locks, Inc., and speaker of the evening.

Little Rhody Tours Corning Glass Works

Lincoln, R. I.—Following dinner at the Lindsey Restaurant, members of the Little Rhody chapter journeyed to Central Falls, R. I., for a tour of the Corning Glass Works.

Three basic types of equipment were viewed in operation, the turret chain making vacuum bottle liners, the Corning ribbon machine making incandescent bulb blanks, and the Velos tube drawing machine for making fluorescent tubing. The machines were designed by Corning and built by a contractor.

James L. Knapp, general manager, addressed the group, giving them little-known facts about the manufacture of Corning products. He said that Corning had been making television tubes as early as 1930 and the firm was now working on colored TV tubes.

He estimated that Corning will produce 1½ billion incandescent bulbs and 40 million fluorescent tubes this year. He added that two Corning ribbon machines in Europe supply all the incandescent bulbs for the continent.

Members were interested to learn that all glass is melted in three large 450,000-lb capacity tanks at 1600 degrees C and would cost about a million dollars to replace. *—M. A. Schoos*

Past Chairmen's Night Starts Boston Season

Boston—It was Past Chairmen's Night as the Boston chapter gathered in New England Mutual Hall on September 10. Present were Joseph P. Crosby, first vice president of ASTE; John X. Ryneska, chairman of the National Constitution and By-Laws Committee; Jim Leone, Prescott Smith, Art Nichols, and Jack Geddes, all Boston past chairmen.

Speaker for the evening was Charles V. Moore, design engineer, Knolls Atomic Power Laboratory, Schenectady, N. Y. His topic was "Atomic Energy for the Layman."

Mr. Moore, who is responsible for the design of components of the Nuclear Reactor for the atomic submarine, explained how that energy is utilized and what the prospects seem to be for the nonexplosive use of atomic energy. Part of the talk, slide illustrated, was devoted to remote handling of radioactive materials. "A-Is for Atom," a color film, was shown.

Also on hand to help Boston launch its technical session season were Marvin Bunting of national ASTE headquarters staff; Vincent Spaher, Lima's past chairman; and Edward Berry of Providence, R. I. *—Harry Midgley*

The first autumn meeting of the Springfield, Ohio, chapter featured a tool seminar at the Springfield plant of the Oliver Corp. The cold extrusion of artillery shells was discussed. Here C. W. Thornell, plant manager, explains the process to R. C. Montanus, chairman, as Ken Forsell, and Ernest Olsen, developer of the process and speaker of the evening, look on. *C. W. Carmichael*

Positions Wanted

SALES ORGANIZATION — with national distribution on inspection equipment can handle additional products. Only first class equipment desired as all of our representatives are inspection specialists. Give complete information as to products available, technical data, present distribution, etc. Write to Box 99, The Tool Engineer, 10700 Puritan Ave., Detroit 21, Mich.

MANUFACTURERS REPRESENTATIVE —With established office and warehousing facilities in Texas, wants to represent tool and/or machine manufacturer. Fifteen years' experience in tool sales and service engineering and have good customer following with large oil tool manufacturers. Prefer grinding wheels, cutting tools or other expendable items. Manufacturer interested in developing business in this fast-growing Texas area, please write Box 133, The Tool Engineer, 10700 Puritan Ave., Detroit 21, Mich.

W. Alexander McCune Appointed Sales Manager

W. Alexander McCune, Jr., has been appointed general sales manager of Norton Company of Canada, Ltd. A former abrasive engineer in the northern New Jersey area, Mr. McCune is a member of the American Society of Tool Engineers. He succeeds C. W. Fell who becomes an abrasive engineer in the Toronto area. Ill health has forced Mr. Fell to take a less strenuous part in Norton activities.

Twin Cities Briefed on Gear Failures

Problems in gear design, production and inspection were of chief concern at the September meeting of Twin Cities chapter. Members and guests numbering over 150 met at the Dunwoody Industrial Institute to hear Anthony Zamis, chief engineer at the Illinois Tool Works.

Walter Sahlin, associate director of Dunwoody, welcomed the group.

Mr. Zamis told the audience why gears fail and how to recognize and control such discrepancies. He also discussed the effect of undercutting teeth in pinions of few teeth and stated that this condition could be remedied by increasing the addendum of the mating gear but increasing the addendum should be done only when the pinion is the driving member. *—W. J. Comstock*

Granite State Tours Knitting Machine Plant

Laconia, N. H.—Granite State chapter members and their guests, numbering about 100, toured Scott & Williams, Inc., manufacturers of knitting machinery, at the September meeting. Members were impressed by a very fascinating demonstration of a knitting machine in operation.

Clarence H. McVey, chief tool engineer at Scott & Williams, gave the group some insight on the pros and cons of decisive design work. He disclosed and demonstrated a piloting method used on drill gages to aid in easy insertion and removal of the gaging pilot pin, generally difficult to attain. The meeting was conducted by Joseph L. Rousseau. *—C. P. Rodwan*

New Haven—Nov. 12. "A

Jack Lipman and L. D. Martin

Eastman Kodak Engineer Speaks in Scranton

Scranton, Pa.—Keystone ASTE members opened their 1953-54 activities with a dinner meeting and technical session at the Masonic Temple on September 3.

The program was presented by Louis D. Martin, gear engineer of the Camera Works Div., Eastman Kodak Co. He spoke to an audience of 150 members and guests on "Inspection of Fine-Pitch Gears."

After his speech, Mr. Martin conducted a general discussion period. Most of the questions asked pertained to the interpretation of gear data which stressed the present-day need for a clearer understanding between design and manufacturing through standardization. A keen interest in the statistical approach to gear design and function was demonstrated. —*Joseph Kopin*

Peterborough Members Study Carbide Tooling

Toronto — Members of the Peterborough chapter traveled by bus to Toronto to tour A. C. Wickman, Canada Ltd., manufacturing specialists in tungsten carbide tools. Members saw a movie, "Wickaloy at Work," followed by the tour of the plant where they witnessed actual production of making cemented carbide tools. —*F. H. Mason*

Potomac Meeting Features Vibration Control Talk

Washington, D. C.—Potomac chapter members turned out for the first fall meeting to hear Donald H. Vance, vice president, Korfund Co., Long Island City, N. Y. The speaker, a graduate of Michigan State College, chose to speak on "Vibration Control." The meeting was held at the Annapolis Hotel. —*F. E. Bellin*

West Coast News

By Andrew E. Rylander

Once again I'm in the role of schoolteacher, having gotten under the wire in spite of physical and mental infirmities and the predicted senility of which, so far, I haven't been conscious. Like I've said before, I prefer to wear out, not wind up in rust.

The class is going to keep me young. The group is composed mainly of tool engineers, designers, supervisors, foremen and skilled craftsmen, who, like myself, feel that there's still a lot to learn. Several are ASTE members with likely prospects among the rest. One thing is sure, there's already enough of know-how among 'em to trip me up plenty if I get off the beam.

In view of the emphasis placed on technical education by the ASTE, it may be of interest that Laney Trade & Technical Institute is now classed as a junior college. The course in advanced tool engineering, sponsored by Golden Gate chapter under auspices of Oakland Public Schools, is therefore on a credit basis. Another step in setting tool engineering curricula on the West Coast.

At a meeting of the educational committee, shortly before the start of the fall semester, we enjoyed a vicarious tour through Europe, Louis Talamini conducting. As Louis put it—and he'd visited Germany, Switzerland and Italy among other places — the good old U.S.A. is still about the best country on earth and he was glad to be "home" again. Maybe we'd all have a greater appreciation of the American way of life from a tour abroad.

On Friday, September 11, I was guest of Thomas Hutton of Thomas Hutton & Son Steel Products at the Hillview Golf Club in San Jose. Tom was host to the ASM at a golf tournament largely reminiscent of the parties staged by Detroit chapter except that the steaks were on the house. And were they good! Among other things, had my first taste of chili, rather hot as compared to smorgasbord.

Browsing around, met Bob McCloud, partner of Cloud Co. and member of Golden Gate chapter who claims University of Michigan as his *alma mater* and asked me to relay greetings to Prof. Boston. Ran across a number of other ASTE-ers in the crowd, among them Phil Freeman, recently promoted to general manager of Coulter Steel & Forge Co.

Also among those present was likable Ben Berlien, one of the most popular members of Golden Gate chapter but so modest that he invariably hides his light under the proverbial bushel. Another good man in an up 'n' coming ASTE chapter. Also ran across Alex Gabay, friend of Harry Conrad, who, as I get it, joined the ASTE while in France. He wanted to be remembered, apropos of which I send his greetings to our Executive Secretary and other friends in the Midwest. About everywhere I go, somebody wants to be remembered to somebody somewhere else. This ASTE is getting to be a small world.

Both Golden Gate and Santa Clara Valley chapters had a happy choice of guest speaker at their September meetings—Kenneth R. Blake, who spoke on "Proper Procedures for Toolroom and Production Grinding." Must have been close to 11 p.m. when he concluded his talk in Oakland. Then came a barrage of questions that ended when, out of kindness of heart, Program Chairman Dean Roulund adjourned the meeting.

It takes a good speaker to hold a gathering that long, especially in view of the long distances that many West Coast members have to cover in order to attend meetings. Ken Blake's middle name should be Thoroughness—he certainly covered his subject from A to Izzard and with considerable ammunition to spare.

Among other things, he is a flying enthusiast, which should make him a pal of Flyboy Grant Wilcox, whose writings and talks on flying almost tempted me to buy a plane.

Greetings from Olle Rodstrom, presently master mechanic at John Deere, Yakima, Washington, a position he has held for the past seven years. Now the plant is closing down. An able tool engineer—hope to see him happily relocated on the Coast. Might add, here, that the northern chapters—Portland and Seattle—seem to be doing right well, the same holding for the Bay Area chapters which are enjoying a steady increase in membership.

Wherever I go, lively interest is being expressed in the '55 Annual Meeting and Tool Show, to be held in Los Angeles. A long way ahead, as we look at things in prospect, yet "just around the corner" the way time flies. One of the nice things about it, the convention will be held in spring when the California hills—I mean mountains—are at their greenest.

Coming MEETINGS

TOOL ENGINEERING CONFERENCE on Nov. 14 at the University of Illinois at Urbana. Co-sponsored by Illinois chapters of ASTE.

INSTITUTE ON TOOL ENGINEERING on Nov. 18 through 20 at the University of Wisconsin at Madison. Co-sponsored by the Madison ASTE chapter.

BUFFALO-NIAGARA FRONTIER—Nov. 12. "Surface Finishing and Finishes" by John A. Harrington of DoAll Co.

CEDAR RAPIDS—Nov. 20. Annual Ladies' Night Dinner Dance.

CHAUTAUQUA-WARREN—Nov. 19, 6:30 p.m., Marconi Club, Warren, Pa. "Friction Cutting and High-Speed Sawing" by George H. Sheppard, director of research and training, DoAll Co., DesPlaines, Ill.

CHICAGO—Nov. 2, 6:30 p.m., Keyman's Club. "New Developments in Cutting Tools" by J. S. Gillespie, Carboloy, Dept. of GE, Detroit; D. D. McCurdy, Chicago Screw Co., Bellwood, Ill.; and Matt Aljanich, Caterpillar Tractor Co., Peoria.

CINCINNATI—Nov. 10, 8:00 p. m., Headquarters of Engineering Society of Cincinnati. "Principles of Locating" by J. I. Karash, process engineer at Reliance Electric and Engineering Co., Cleveland.

CLEVELAND—Nov. 13. Short Run Tooling Forum. Nov. 23. Carbide Division. Kentanium and chromium carbides.

EVANSVILLE—Nov. 9, 6:30 p.m., Smitty's Steak and Sea Food House. "Tool Steel and Tool Steel Failures" by John R. Harbaugh, assistant vice president sales, Jessop Steel Co.

FORT WAYNE — Nov. 11, 6:45 p.m., Chamber of Commerce. "The Hydroform—A New Kind of Machine Tool" by K. P. Martin of Cincinnati Milling Machine Co., Cincinnati. Dec. 9, 6:45 p. m., Chamber of Commerce. Talk on "Speedgrip Chuck" by a representative of Speedgrip Chuck Div., Ernest, Holdeman, Collet, Inc.

FOX RIVER VALLEY—Nov. 3, 7:00 p.m., Baker Hotel, St. Charles, Ill. "Sports Cars" by William T. Crane.

GREATER LANCASTER — Nov. 10, 6:45 p.m., Armstrong Cork Co. Education night.

HOUSTON—Nov. 10, 6:00 p.m., Ben Milam Hotel. "Davis Boring Tools—Their Features and Applications" by Milton J. Kuhn, field sales manager, Davis Boring Tools Division of Giddings and Lewis Machine Tool Co., Fond du Lac, Wis.

INDIANAPOLIS — Nov. 5, Executives Night. "Engineering for the Future" by Tell Berna, general manager, National Machine Tool Builders Assoc., Cleveland, Ohio.

LA CROSSE—Nov. 24. "Quality Controls" by Arthur Bender, Delco-Remy Division of General Motors Corp., Anderson, Ind.

LEHIGH VALLEY — Nov. 20. Tour of Bethlehem Steel Co., Reading, Pa.

LIMA—Nov. 19, 6:30 p.m., Royal Pine Room. "Quality Castings—The Key to Greater Production" by C. E. Herrington, manager sales engineering department, Meehanite Metal Corp., New Rochelle, N. J.

LITTLE RHODY—Nov. 5. "Small Parts—Design and Manufacture" by N. K. Perkins, International Business Machine Corp., Poughkeepsie, N. Y. Dec. 5, Christmas party.

LONG ISLAND—Nov. 9, 5:30 p.m., Tour of Grumman Aircraft Eng. Corp., Bethpage, L. I. 7:00—dinner. 8:30 meeting. "Precision Boring" by Charles B. De Vlieg, president, De Vlieg Machine Co., Detroit. Members only.

LOUISVILLE — Nov. 10, 6:30 p. m., YMCA. "Die Steels—Their Heat Treatment and Use" by L. V. Klaybor, associate director of research, Allegheny Ludlum Steel Corp., Dunkirk, N. Y.

MID-HUDSON—Nov. 10, 6:30 p.m., Nelson House, Poughkeepsie, N. Y. "Atomic Energy for the Layman" by Charles V. Moore, Reactors Unit, General Electric Co.

MILWAUKEE—Nov. 13, 6:30 p.m., Allen-Bradley Co. Plant tour. Coffee speaker will be the sales promotion manager of Milwaukee Braves.

NEW HAVEN—Nov. 12. "Automation" by John S. Brozek. Dinner at Hotel Garde.

NORTHERN MASSACHUSETTS—Nov. 17, 7:00 p.m., Gardner, Mass. "Facts about Taps and Tapping" by Oscar E. Koehler, chief engineer, Greenfield Tap and Die Co., Greenfield, Mass.

NORTH TEXAS—Nov. 13, 7:30 p.m., International Airport. "Plastic Tooling" by Howard Stevens, vice president and general manager, Rezolin, Inc., Los Angeles.

PIEDMONT—Nov. 9, King Cotton Hotel, Greensboro, N. C. Annual Executives' Night Banquet. Featured speaker William H. Neal, senior vice president Wachovia Bank and Trust Co. of Winston-Salem.

POTOMAC—Nov. 20, 6:45 p.m., Hamilton Hotel. "Carbide Cutting Tools" by William Smith, tool specialist and vice president, W. C. Chapman & Sons, Baltimore.

ROCKFORD—Nov. 12, Lafayette Hotel. "Significant Developments in Gearing" by W. P. Schmitter, chief engineer, Falk Corp., Milwaukee.

ROCHESTER—Nov. 2, "Surface Grinding" by John A. Harrington of DoAll Co., DesPlaines, Ill.

SAGINAW VALLEY—Nov. 12, 7:00 p.m. Saginaw Steering Gear Plant No. 2. "Power Steering" by Mr. Lincoln, chief engineer at the plant.

TOLEDO — Nov. 13, Toledo Turners Club. Annual Ladies' Night.

TORONTO—Nov. 4, 6:30 p.m., Oak Room, Union Station. "Tooling and Fixtures for Vertical Turret Lathes" by a representative of Bullard Co.

TUCSON—Nov. 10, 7:00 p.m., American Legion Hall. Speaker, dinner and movie. Ladies invited.

TWIN CITIES—Nov. 7, 6:00 p.m. Dinner and plant tour of Viking Drill and Tool Co. Speaker Nels Louver, owner and president of the company.

TWIN STATES—Nov. 11, Trade Winds Cafe, Springfield, Vt. "Micro Precision in Production" by Adam Gabriel, president, Acme Industrial Co., Chicago.

WILLIAMSPORT—Nov. 9, 7:00 p.m. Angler's Club. "Modern Broaching, Design and Application" by Joseph Psenka, field engineer, National Broach and Machine Co., Detroit.

Directory of ASTE Chapter Chairmen and Meeting Nights

AKRON, Third Tuesday, F. A. Flannery, [illegible] Edgerton Rd., Akron, Ohio

ALBUQUERQUE, First Friday, H. P. Baecker, 1721 Ridgecrest Dr., Albuquerque, N.M.

ATLANTA, Third Monday, C. D. Toney, Jr., 774 Dill Ave., S.W., Atlanta, Ga.

BALTIMORE, First Wednesday, D. E. Wernz, 1214 Regester Ave., Baltimore 12, Md.

BINGHAMTON, First Wednesday, H. D. Bertholf, 46 Matthews St., Binghamton, N.Y.

BOSTON, Second Thursday, W. B. Wells, 94 Walnut Hill Rd., Chestnut Hill 67, Mass.

BUFFALO-NIAGARA, Second Thursday, W. J. Iekel, R.F.D. 1, Springville, N.Y.

CANTON, Fourth Tuesday, C. H. Smith, 602 9th St., N.W., Canton, Ohio

CEDAR RAPIDS, Third Wednesday, R. L. Coyner, 119 Rapids Ave., S. W., Cedar Rapids, Iowa

CENTRAL PENNSYLVANIA, First Wednesday, R. H. Meckley, R.F.D. 1, Red Lion, Pa.

CHAUTAUQUA-WARREN, Third Thursday, R. J. Wilson, Jr., Sylvania Prod. Co., Warren, Pa.

CHICAGO, First Monday, H. A. Paine, Federal Machine Sales, 4639 Washington Blvd., Chicago 44, Ill.

CINCINNATI, Second Tuesday, R. B. Niebusch, 3921 Woodford Rd., Cincinnati 13, Ohio

CLEVELAND, Second Friday, G. W. Carlton, 1910 Seneca Dr., Euclid 17, Ohio

COLUMBUS, Second Wednesday, E. A. Bartlow, 2080 Riverside Dr., Columbus 12, Ohio

DAYTON, Second Monday, R. A. Miller, Economy Tool & Die, P.O. Box 127, Dayton 10, Ohio

DECATUR, Next to last Thursday, Robert Serr, Forrest Knolls Est., Decatur, Ill.

DENVER, First Thursday, C. J. Helton, 61 S. Cherokee, Denver 9, Colo.

DES MOINES, Third Wednesday, G. F. McMaster, 304 Hillside, W., Des Moines, Iowa

DETROIT, Second Thursday, Michael Pinto, Douglas Tool Co., 3437 Goldner Ave., Detroit 10, Mich.

ELMIRA, First Wednesday after second Tuesday, E. C. Bates, 111 Oakwood Ave., Elmira Hts., N.Y.

ERIE, First Tuesday, H. M. Rudd, 2717 Cascade St., Erie, Pa.

EVANSVILLE, Second Monday, P. W. Vierling, Benerson Corp., 418-424 N. Willow Rd., Evansville 20, Ind.

FAIRFIELD COUNTY, First Wednesday, R. W. Smith, 141 Edgehill Rd., Fairfield, Conn.

FOND DU LAC, Second Friday, E. J. Kaiser, 530 E. Division St., Fond du Lac, Wis.

FORT WAYNE, Second Wednesday, D. D. Welbaum, 2318 Wayne-Wood Dr., Ft. Wayne 6, Ind.

FOX RIVER VALLEY, First Tuesday, P. C. Shaner, 203 N. Washington, Batavia, Ill.

GOLDEN GATE, Third Wednesday, D. A. Gustafson, 2765 Argyle St., Oakland 2, Calif.

GRAND RIVER VALLEY, First Friday, John Ward, Can. General Tower, 52 Middleton St., Galt, Ont., Can.

GRANITE STATE, Second Tuesday, J. J. Repetto, Clarostat Mfg. Co., Washington St., Dover, N.H.

GREATER LANCASTER, Second Tuesday, R. C. Moorhead, 1912 Sterling Pl., Lancaster, Pa.

GREATER NEW YORK, First Monday, H. W. Barclay, New York Times, 229 W. 43rd St., New York, N.Y.

HAMILTON, Second Friday, C. E. Bulmer, 43 Whitton Rd., Hamilton, Ont., Can.

HARTFORD, First Monday, O. A. Gingras, Pratt & Whitney Div., West Hartford, Conn.

HOUSTON, Second Tuesday, H. O. Traughber, 302 Norwood, Houston 11, Tex.

INDIANAPOLIS, First Thursday, Joe Penn, 526 Mills Ave., Indianapolis 27, Ind.

JACKSON, Third Monday, Theodore Vickers, 726 Griswold St., Jackson, Mich.

KANSAS CITY, First Wednesday, M. R. Grundy, 2600 Somerset Dr., Kansas City 5, Mo.

KEYSTONE, First Thursday, Jack Lipman, 439 Irving Ave., N., Scranton, Pa.

KNOXVILLE-OAK RIDGE, M. B. Hilton, Lester Rd., Rte. 10, Knoxville, Tenn.

LACROSSE, Fourth Tuesday, E. J. Giroux, 1035 S. 19th St., La Crosse, Wis.

LANSING, Fourth Monday, R. F. Gietzel, Rte. 2, Box 380, Lansing, Mich.

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LITTLE RHODY, First Thursday, F. W. Kunath, 29 Taylor St., Cranston, R. I.

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LONG BEACH, Second Wednesday, C. E. Blanchard, 5760 Appian Way, Long Beach 3, Calif.

LONG ISLAND, Second Monday, Arthur Cervenka, Vanderbilt Blvd., Oakdale, L. I., N. Y.

LOS ALAMOS, First Wednesday after second Tuesday, R. H. Moller, 2146A 43rd St., Los Alamos, N. M.

LOS ANGELES, Second Thursday, C. L. Almquist, Almquist Bros., 2300 E. 49th St., Los Angeles 58, Calif.

LOUIS JOLIET, Third Tuesday, H. J. Moffat, Caterpillar Tractor Co., Joliet, Ill.

LOUISVILLE, Second Tuesday, R. F. Lenz, 3127 Eagle Pass, Louisville 13, Ky.

MADISON, Third Thursday, E. C. Helmke, Gisholt Mach. Co., 1200 E. Washington, Madison 10, Wis.

MEMPHIS, Second Friday, A. T. Hicks, Hays Machine Tool Co., 269 So. Front, Memphis, Tenn.

MID-HUDSON, Second Tuesday, S. P. Cook, Vassar View Rd., Poughkeepsie, N. Y.

MILWAUKEE, Second Thursday, E. J. Anspach, Line Material Co., 700 W. Michigan St., Milwaukee 2, Wis.

MOHAWK VALLEY, Fourth Tuesday, E. K. Wheat, 301 Otsego St., Ilion, N. Y.

MONTREAL, Second Thursday, C. A. Gareau, 1080 Crevier Ville, St. Laurent, Que., Can.

MUNCIE, First Tuesday, N. E. Hines, 2106½ So. Washington St., Marion, Ind.

MUSKEGON, Paul Hornak, 1917 Seminole Rd., Muskegon, Mich.

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NEBRASKA, Third Thursday, J. A. Duncanson, P. O. Box 148, Seward, Neb.

NEW HAVEN, Second Thursday, E. E. Lull, Crucible Steel Co., 131 Park St., New Haven, Conn.

NEW ORLEANS, First Tuesday, L. B. Graham, 4994 Montegue, New Orleans, La.

NIAGARA DISTRICT, First Thursday, A. A. Clarkson, 154 S. Dr., St. Catharines, Ont., Can.

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NORTHERN NEW JERSEY, Second Tuesday, W. E. Wheaton, 915 W. 6th St., Plainfield, N. J.

PATERSON, C. M. Bazaz, 272 Maryland Ave., Paterson, N. J.

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PIEDMONT, Second Monday, E. N. Dietler, Crucible Steel Co., P. O. Box 2402, Charlotte, N. C.

PITTSBURGH, First Friday, L. J. Brozek, 2508 Collins Rd., Pittsburgh 35, Pa.

PONTIAC, Third Monday, H. V. Phipps, Cutting Tool Supplies, 88 S. Cass Ave., Pontiac, Mich.

PORTLAND, ME., Second Friday, F. B. Taylor, 18 Birch Ln., R.F.D. 4, Portland, Me.

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ROCHESTER, First Monday, D. F. Kohler, 240 Vanvoorhis Ave., Rochester 17, N. Y.

ROCKFORD, Second Thursday, William Moreland, 3304 Minnesota Ave., Rockford, Ill.

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ST. LOUIS, First Thursday, W. J. Potthoff, Rte. 2, Box 64, Graeser Rd., Creve Coeur, Mo.

SALT LAKE CITY, Second Friday after first Wednesday, Frederick Preator, 530 N. Third, East Logan, Utah.

SAN DIEGO, Second Tuesday, A. E. Crom, 1759 Oliver Ave., San Diego 9, Calif.

SAN FERNANDO VALLEY, First Wednesday, Rudolph Regen, 4523 Fulton Ave., Sherman Oaks, Cal.

SAN GABRIEL VALLEY, First Thursday, Peter Carter, Rain Bird Sprinkler Mfg. Corp., 19233 E. Foothill, Glendora, Calif.

SANTA CLARA VALLEY, Third Tuesday, W. C. Lanyon, 104 Oak Hill Way, Los Gatos, Calif.

SCHENECTADY, Second Thursday, G. S. Nelson, 315 Florida Ave., Amsterdam, N. Y.

SEATTLE, Fourth Tuesday, R. A. Coady, 6559 43rd Ave., N. E., Seattle 5, Wash.

SOUTH BEND, Second Tuesday, J. L. Kemp, 909 Sherman, South Bend 16, Ind.

SPRINGFIELD, ILL., First Tuesday, E. J. Kane, 200 S. MacArthur Blvd., Springfield, Ill.

SPRINGFIELD, MASS., Second Monday, R. M. Dickson, 29 Maybrook Rd., Springfield 9, Mass.

SPRINGFIELD, OHIO, Second Tuesday, R. C. Montanus, Signal Hill Rd., Springfield, Ohio.

SYRACUSE, Second Tuesday, R. D. Fulford, 309 Melrose Ave., Syracuse 6, N. Y.

TOLEDO, Second and Fourth Wednesday, J. J. Kertz, 4554 Willys Parkway, Toledo 12, Ohio.

TORONTO, First Wednesday, D. R. J. Few, 85 Northline Rd., Toronto, Ont., Can.

TRI-CITIES, Second Wednesday, G. H. Jording, 2015 42nd St., Rock Island, Ill.

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TULSA, Second Thursday, L. W. Williams, 717 So. Marion, Tulsa, Okla.

TWIN CITIES, First Wednesday, C. E. Fasth, 2700 29th Ave., N. E., Minneapolis 18, Minn.

TWIN STATES, Second Wednesday, George Julien, 26 Smith St., Springfield, Vt.

WATERLOO AREA, Third Wednesday, G. E. Osworth, Tecumseh Products, Tecumseh, Mich.

WESTERN MICHIGAN, Second Monday, H. J. Swanson, Swanson Machine, 1422 Lake Dr., S.E., Grand Rapids 6, Mich.

WICHITA, Second Wednesday, A. A. Reddy, 430 S. Vine, Wichita, Kan.

WILLIAMSPORT, Second Monday, W. J. McCoy, 316 E. Central Ave., S. Williamsport, Pa.

WINDSOR, Second Monday, J. F. Johnston, 30 Thomson Blvd., Riverside, Ont., Can.

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UNUSUAL SURFACE FINISH

News in Metalworking . . .

METHOD ALLOWS NONFERROUS TUBING TO BE WELDED AT HIGH SPEED

Perfecting the process and equipment necessary for continuous high speed cold forming and welding of nonferrous metals in completely integrated tube mills has been the subject for exhaustive study by The Yoder Co. of Cleveland for some time.

Now, the first two tube mills as a result, for converting coiled nonferrous strip at high speed into welded tubing have been completed by the company, and several more are reported on order and being built.

The hot processes of making seamless tubing in the past have been universally employed because the abrupt melting point of most nonferrous metals has precluded successful welding at speeds high enough to be economical.

By the Yoder process, the induction welding on nonferrous tubing is done at speeds ranging from 40 fpm up to 120 fpm, depending on kind of metal, gage and diameter of tube. This is from ten to thirty times faster than practical by methods of welding heretofore known, and even compares favorably with speeds obtained in resistance welding of steel tubing, where the practical maximum so far has been about 150 fpm.

Induction welding of nonferrous metals is done by high frequency current introduced through a short inductor coil, through which the cold-formed tube passes without contact. The current travels around the surface of the tube in the region of the inductor; then flowing flows along the converging edges of the still unwelded tube, to and from a nearby point of convergence, which is substantially beyond the field of induction and close to the center line of a set of rolls which press the seam edges together. As the current approaches the point of convergence of the edges, it is confined to a very shallow layer on the surfaces of the two abutting edges, due both to the skin effect and the proximity effect.

Physical tests made on samples of type 304 stainless steel show that the tensile strength of the metal in the weld zone is about 15 per cent higher than for strip from which the tubes were made.

Similar results have been obtained in tests on other nonferrous metals, showing consistent weld strength, which is at least as high as that of the coiled strip from which tubing is made.

Welds in tubes made from different grades of aluminum, nickel and other metals, show uniformly narrow weld zones with a grain structure almost unaffected by the heat.

Weldable metals include most all of the aluminum alloys available in coiled sheet form, certain magnesium alloys, many of the brasses and other copper alloys, nickel and its alloys as well as austenitic and ferritic stainless steel and lighter gages of carbon steels, in which the percentage of carbon is less critical than in electric-resistance and other types of welding.

In the past, although a potential market existed for the lighter gages, the practical minimum thickness for extruded aluminum alloys has been about 0.05 in. mainly due to the fact that edges of the lighter gages tended to buckle in the initial cold forming passes.

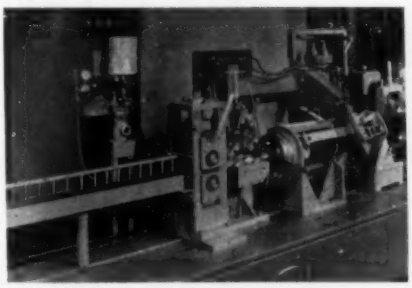
By comparison, steel tubing could be more economically made commercially cold formed and electric-welded in gages down to 0.028 in., with a low limit of 2 per cent applying to the ratio of wall thickness to tube diameter.

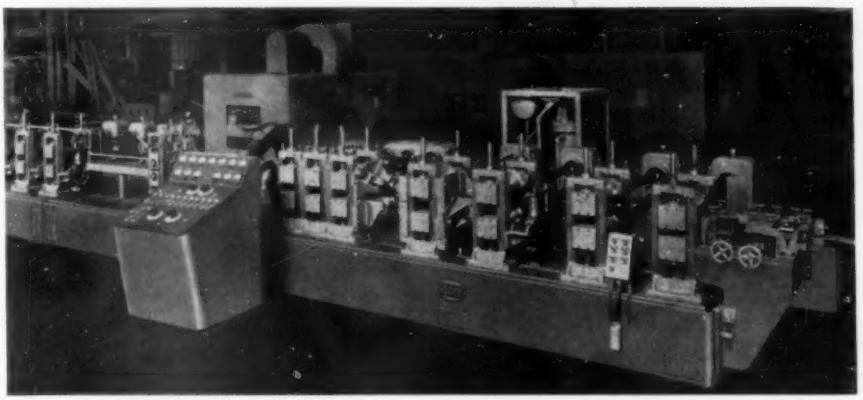
With the new methods of forming the nonferrous alloys now have brought the thickness diameter ratio down to 1 percent, and the low limit of wall thickness down to 0.025 in., and opened up new marketing possibilities for the light gage nonferrous tubing.

As an example, it has been found the process is very adaptable for making many types of cable. With high speed there is the additional advantage of continuous forming around cable of any desired length. Further, the cable can be fed into the mill simultaneously with the strip, the latter being formed around it and welded without injury to any covering of paper or rubber. In passing through the sizing mill, the sheathing is rolled down or sized to fit tightly around the cable, thus the process avoids necessity of a separate operation to pull the cable through the finished sheathing.

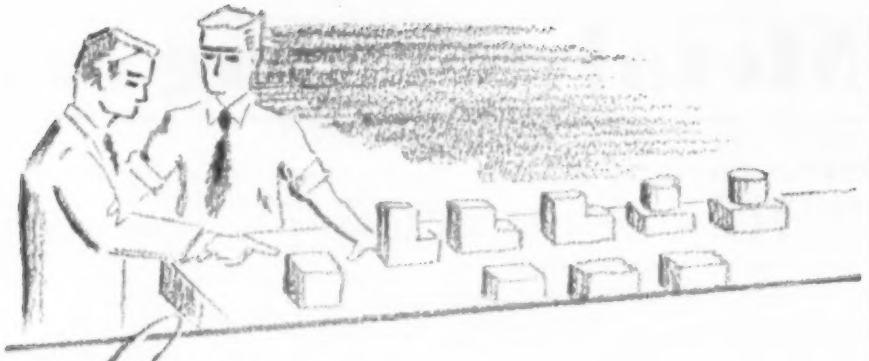
The mill already built for the Bridgeport Brass Co. is designed to operate at speeds from 40 to 120 fpm, depending on gage and kind of metal to be welded. Its capacity ranges from ¾ to 4-in. tubing, in gages from 0.025 to 0.134 in. A similar mill also has been completed for the Kaiser Aluminum and Chemical Corp., while two others are now under construction. The mill for the Aluminum Corp. of America will have a capacity up to 8 in. diameter, while one for the U.S. Navy will make tubing up to 5 in. diameter.

This close-up view shows the induction welder. Located on the base are (right to left) seam guide with spreader blade for holding top gap in tubing open to predetermined width; triple-cluster squeeze rolls; tandem weld flash cutters; and ironing roll stand.





Mill is now ready for operation. At extreme right, strip is entering the starting table. Welder with control desk is to left of center.



Cut **PRODUCTION COSTS with the** *right* **plant layout**

Many of our clients are amazed by the cost savings realized when we "revamp" their plant layouts. This entails the rearrangement in equipment, the elimination of unnecessary handling operations, and the complete reorganization and integration of their "production flow".

The right kind of plant layout stems from an objective approach toward every phase of production. It helps to iron out all the production "kinks", reduce inventories, lower handling time, eliminate back-tracking, and assist in production control.

Pioneer has developed a thorough system of procedure in transferring the poor plant layout into one that reaps cost savings far beyond anything anticipated by the client. This procedure entails the preparation of process flow charts, taking into consideration such factors as methods, material handling, temporary and permanent storage, and inspection of materials. The flow chart is then transferred into a set of templets . . . or scale models . . . which is developed into a plant layout, allowing us to analyze the client's production from all angles.

We'll be glad to help show you how to cut production costs . . . with the right plant layout . . . tailored to meet your specific production needs! Send today for Bulletin 162-G on "How to Harness Your Production".

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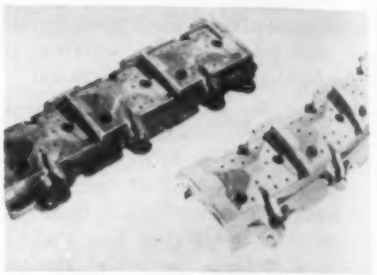
UNUSUAL SURFACE FINISHING TECHNIQUE INTRODUCED

Greater uniformity than may be obtained by conventional surfacing techniques is possible as a result of a method of treating metals recently announced by the American Metaseal Mfg. Corp. Known as "Metablast," this process applies the theory that controlled surfaces are better than "supersmooth" surfaces to reduce friction, dissipate heat, and prevent moving metal parts from seizing, sticking, or burning.

Fundamentally the process consists of shooting a specially developed abrasive that is suspended in liquid, in a controlled high-pressure spray against a metal surface. The spray produces many minute identical "wells." These tiny pits can be varied in coarseness or fineness, as desired, by using several different grades of abrasive, and changing the spray's length, force, or direction. The engineers who developed the process claim that tolerances of precision parts to 0.0001 inch may be maintained. These tolerances are more than adequate for most industrial processes.



To allow comparison, the piece on the right has been treated by Metablasting, while the other was subjected to a conventional method.

With Metablast, engineers are able to achieve predetermined surfaces time after time without variation, which would make it superior to many older processes which did not provide uniformity. As a result it could not be predicted whether or not one surface would be the same as another and fine tolerances could not be maintained.

Almost any phase of industrial production is affected by surface conditioning; two major problems resulting from improperly prepared surfaces being friction and heat. Modern surfacing techniques can solve problems also involving proper inspection as well as plate and scale removal.

The minute wells, produced on the surface of casting molds, reduce sticking between mold and casting, allowing easier removal of parts and preventing directional lines. Molten metal flows more smoothly on this mat surface, preventing defects on finished surface.

In the same vein, dies for punching, stamping and pressing operations give better reproduction. Die walls with

CAST ALUMINUM GIANT

super-smooth surfaces often cause the metal to grip at the pressure radii, producing thick and thin sections. Controlled mat surface allows the metal being formed to slide smoothly over the die. As in molding, Metablasting facilitates part removal and prevents formation of directional lines.

Improperly prepared surfaces cause galling in mating metal parts such as bearings and gears. Here, Metablasted surfaces serve a twofold function: the minute wells act as reservoirs for lubricant, assuring an evenly distributed film at all times; and, too, the smaller contact area of Metablasted parts reduces the danger of galling. The increased surface area produced by the wells also allows better heat dissipation, hence less failures of bearings and gears.

Economy Also Feature

Increase in tool life—by more than 700 percent in some cases according to reports from the engineers—is another result of this decreased friction and improved heat dissipation. A manufacturer of office machinery reported that Metablast has extended the period between tool grindings from 24 to 185 hours, because tools had more effective surfaces. Grinding a tool normally leaves a serrated surface on the working face. These ridges cause chips to stick to the tool, dulling and abrading it. Chips tend to slide away on Metablasted surfaces, permitting the tool to operate smoothly.

The method can also be used as a pre-treatment to prepare metal for painting, bonding, plating and buffing. The slightly roughened surface provides a toe-hold for coatings and assures proper bonding. In buffing, the mat surface is said to reduce buffing time by as much as 90 percent.

The process also may be used as a fast, economical method of cleaning hard crusts, rust, heat treat scale, old paint, plating or other coatings from metallic parts. It produces a surface which can be placed into subsequent finishing operations without additional treatment. Water companies are using Metablast to recondition pump and meter parts after rust and scale accumulations impaired their accuracy. It also cleans glass and rubber molds inexpensively and quickly, increasing productive time.

In dials and other gage elements, the mat surface reduces glare that interferes with accurate readings. The softer, diffused light reduces employee fatigue. Similarly, the slightly roughened surface facilitates inspection for flaws. Checks and cracks are easily detected because of the slight amount of water that remains in such flaws.

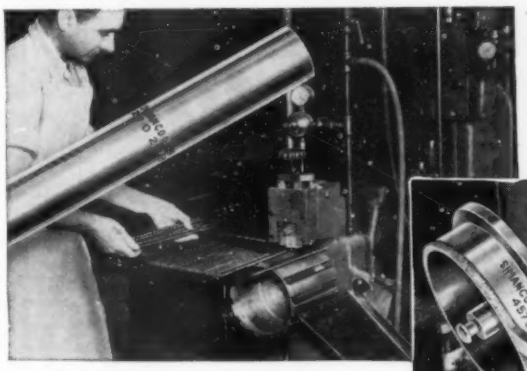
LEADERS IN INDUSTRY MARK WITH NOBLEWEST

How Singer marks best with Noblewest

For nearly half a century, Noblewest has been supplying leaders of industry—such as the Singer Manufacturing Company—with precision marking equipment. Singer uses every basic type of Noblewest Roll-O-Matic marking machine to permanently roll-in inscription markings. For faster, money-saving marking in your plant, contact Noble & Westbrook Mfg. Co., 16 Westbrook Street, East Hartford 8, Connecticut.

← ***SERIES 50*** —Noblewest general purpose marking machine with full pneumatic operation. Can be tooled for marking flat and round surfaces, for precision graduating and for serial numbering with Noblewest automatic numbering heads.

SERIES 20 —This rapid precision marking machine will premanently mark up to 5,000 pieces per hour. Ideal for parts that will stand up and rotate on the carrier dial. Three interchangeable pressure dials mark approximately 50 different parts on this one Noblewest machine. →



← ***SERIES 19*** —Has production of 6,000 pieces per hour. The die holder on this model has automatic pressure compensator for insuring uniform depth of markings regardless of slight variation of part sizes.

SERIES 21 —A Noblewest rapid production marking machine with a capacity of 2500 to 3500 pieces per hour. Ideal for parts on which markings must be accurately positioned. →

MARK IT BEST WITH NOBLEWEST Roll-O-Matic MARKING

NOBLEWEST IMPROVED MARKING DEVICES

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

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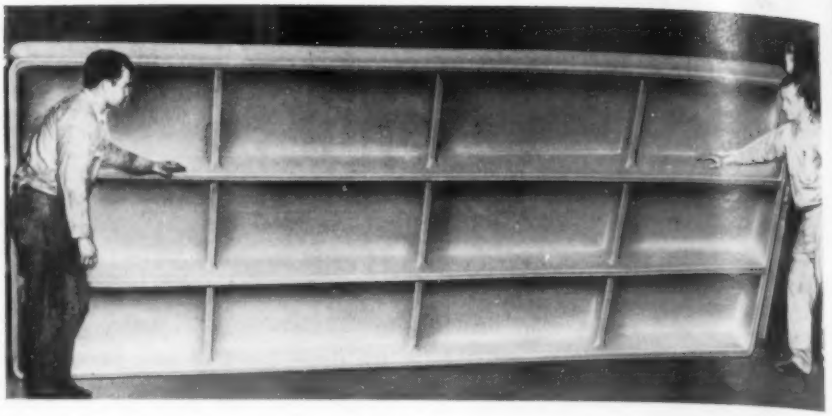
CAST ALUMINUM GIANT

The largest aluminum casting ever poured in a single piece in the West was made by Pioneer Tool Engineering, Inc. at El Segundo, Calif. Although Pioneer had been supplying aircraft and other western plants with cast aluminum tooling plate and bars for more than ten years, there were no molds in which to pour a casting this size, as ordered by Consolidated Vultee Aircraft Corp. Engineers solved the problem by making a sand core mold especially for the job. Weighing 6500 pounds, the casting measures 6 x 15 ft.



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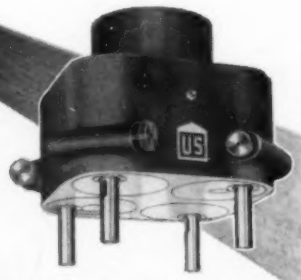


Single eccentric type for equally spaced holes on bolt circles.

New double eccentric AdjUStafix, two to eight spindles, for any adjustment. Eliminates the expensive change in set-up from job to job by simply changing the drill pattern plate and relocating spindles. Fully automatic lubrication for either horizontal or vertical operation.

The universal joint adjustable multiple spindle type, an adaptation of a universal joint adjustable spindle, is suitable for any sensitive drilling machine. Joints self-lubricating. Designed for quick change.

We manufacture all types of multiple spindle, fixed center, adjustable and lead screw tapping heads.

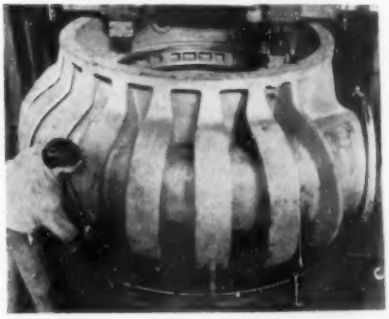
UNITED STATES DRILL HEAD CO.,
616-618 Burns St., Cincinnati 4, Ohio

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-110

WEST MAKES BIGGEST STEEL PUMP CASTING

Shown here is one of four 38,000-lb cases for centrifugal pumps, the largest single-piece steel pump casting ever produced in the West Coast, being machined on a 7-inch spindle floor type horizontal boring, drilling and milling machine at the National Supply Co's, Torrance, Calif. plant. Reverse drilling is done by means of an underarm support with attachment.

Internal diameters of the pump case were turned on a vertical boring machine with a table of 120-inch diameter, the largest of its type in the plant. Skill



in foundry engineering minimized the amount of metal to be removed by machine cutting operations.

Although casting size and weight are exceptional, the most significant fact is that they would be much greater except for enginering design and foundry production methods that permit minimizing weight while maintaining a high factor of safety. In the accomplishment of these results design and production became more complex.

The pump is to be used in the 457-mile Colorado River Aqueduct system to deliver water to Los Angeles. In service, the impeller inside this case will lift 90,000 gallons of water per minute to a height of 300 feet, which is reported to be a world record combination of volume and pressure.

Tools of Tod

AUTOMATIC HANDLING OF ROLLERS

A two-way Holesteel machine, designed for complete automation and flexibility in the loading, drilling, countersinking, tapping and unloading of tractor track rollers, has been developed by National Automatic Tool Co., Inc., Richmond, Ind.

In this machine provision is made to handle any of three sizes of rollers without changing setup and without touching part by hand. For utmost flexibility, the machine was made to handle eight right- or left-hand parts in each of the three sizes.

Work follows this operation sequence: the part is rolled on a track into preload position at the front of the machine and then elevated automatically to a higher level which places the part in position for rolling into position opposite the proper one of three arbors which then clamp the part automatically into the trunnion fixture.

From this loading and unloading position the machine automatically indexes and carries the part into a second position for drilling and counter-sinking both ends of the part. The machine again indexes automatically and the part is in position for tapping.

After the third index, the part is in unloading position and automatically unclamped and rolled on a track out of the machine. Only one of each of three sizes of tractor track roller is machined at one time. Production is 72 parts per hour.

HANDLING HAZARD ERASED

The special transfer mechanism pictured here is designed to index, advance and unload 22-lb brake drums through a 600-ton coining press. The press attendant who formerly would have had to locate the drums properly in the die with his hand beneath the punch, now needs only to place the drums in the preload position. Subsequent operations are automatic. In addition to its inherent safety value, the mechanism enables users to utilize full production capacity of the press.

"To sum it up, chief, we can do it if we use Columbia MAXITE Tungsten-Cobalt High Speed Steel."

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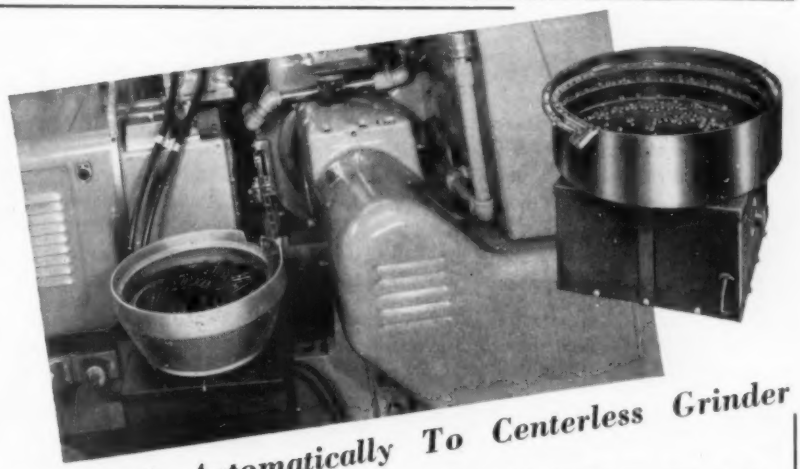
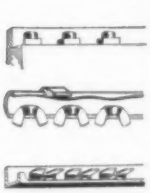
TOOL COLUMBIA STEELS



Slugs Fed Automatically To Centerless Grinder

with SYNTRON

PARTS FEEDERS



Small parts emerge from feeder trough in desired position, one at a time, at variable controlled speeds.

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Tools of Today . . . .

Static Rectifier D-C Welders Use Standardized Parts

A selenium rectifier d-c arc welder has been developed by Westinghouse Electric Corp., Buffalo, N. Y. which incorporates a number of advantages, including minimum maintenance requirements, high dependability, and wide versatility and user convenience. It also is smaller, weighs less, is better vented, contains overload protection, has an arc circuit to give better welding, has improved welding characteristics and the various sizes use parts standardized for the entire line.

Essentially, the unit consists of two parts: a three-phase, full-wave selenium rectifier, and a Transactor unit which is a combination of a three-phase transformer and a movable core reactor. With the introduction of the Transactor unit, the designer has created a smaller, lighter, more convenient current control and voltage step-down device. It has two three-phase laminated cores. Primary and secondary coils are wound on one, while a stationary core and a movable core make up the other. Legs of the movable core are linked by the common secondary and reactory winding.

The movable core is supported by guides on the welder side members. Two acme screws supported by the stationary core section drive the movable core by means of a hand crank on top of the welder. Moving the core vertically in and out of the Transactor unit coils controls current—when the movable core is at a maximum distance from the stationary core, the welder output current is maximum, when close to the stationary core, current is minimum.

These coils are made of aluminum, the first such application in a welder. Copper crimp type terminals are attached to the aluminum leads to assure low-resistance contact. Using aluminum helps toward two objectives—lighter weight and less cost.

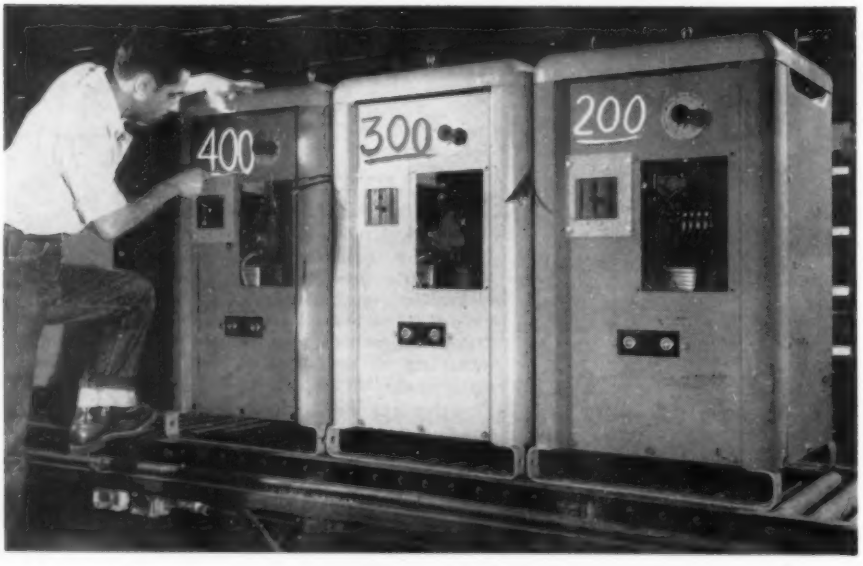
An important feature of the machines is that although the three standard units are 200, 300 and 400-ampere sizes, they are easily joined in parallel to make Duplex models of 300/600, 400/800 ampere ratings. These essentially are two single units mounted on a common bedplate and enclosed in a single case. They can be used as two single units or paralleled by joining the secondary leads to produce a unit with twice the single unit current rating. Any number of units and any combination of ratings can be combined to make any desired size welder simply by paralleling the secondary output leads. No equalizer or other special connections are required. Current output of each machine in a paralleled group will be that current for which the machine is set.

As another feature, the machine avoids the danger of the arc shorting out during metal transfer from the electrode, as sometimes happens in welding vertical or overhead welds or where a short arc must be maintained, by incorporating the Arc Drive Control. This permits independent control of the dynamic and static characteristics of the welder by varying the ratio of short-circuit current to welding current. When the arc begins to short out, this control supplies instantaneous current surges of variable amounts depending upon the requirements. The current surges clear the shorts and reestablish the welding. The Arc Drive circuit itself consists of a three-phase, half-wave rectifier, energized by tertiary windings on the Transactor unit; a thermoguard and a rheostat which controls the magnitude of the current surges. Its voltage is slightly lower than the welding arc voltage. When arc voltage is equal or greater than this value, the Arc Drive circuit supplies no current to the welding arc, but should the load voltage fall below this critical value, the Arc Drive circuit automatically begins to supply current, increasing as load voltage decreases. Current from the Arc Drive is adjustable and adds directly to the current from the main circuit.

To defeat the possibility of overloading and overheating the equipment (a problem which has often developed with machines that have been designed on a duty cycle basis and which attain 10 to 125 percent more of their rated output) the unit has a manually operated, shunt trip, three-pole, de-ion circuit breaker connected to the primary leads. A thermoguard wound into one of the coils of the Transactor unit energizes the shunt trip coil. When the

Here the d-c welder is shown in use.

The 200, 300 and 400-ampere welders appear side by side to compare their uniformity. They not only have the same cases, but identical bases, covers, cooling fans and motors, mechanical parts and core punchings.



USE READER SERVICE CARD ON PAGE 131 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

welder is overloaded by operating at an excessive duty cycle or without the ventilating fan in operation, the coils overheat and the thermoguard closes, activating the shunt-trip mechanism which causes the circuit breaker to open and shut off the welder. When the Transactor unit coil temperature returns to a safe value, the thermoguard automatically opens and the circuit breaker may be reset and closed manually and welding resumed.

Ventilation is axial flow, with the fan located in the top of the unit and air intake located at the bottom. The upward flow of air follows natural convection and results in maximum cooling. Having no air exhaust at the bottom also has the attendant advantage of not stirring up dust from the floor.

The high degree of interchangeability of standard parts among the welders in all ratings has several obvious advantages, among them being ease of maintenance. In addition many of the same parts will be standard for the a-c welder line which is being redesigned currently.

T-11-112

Metal Cleaner

A metal cleaner, specially formulated for use in the vitreous enameling industry, has been developed by the Detrex Corp., 14331 Woodrow Wilson, Detroit.

Described as a medium-high alkaline compound containing very high wetting and penetrating properties, Detrex 63, claims as one of its most outstanding assets an exceptional ability to emulsify large quantities of mineral oils and greases and keep them in a state of suspension.

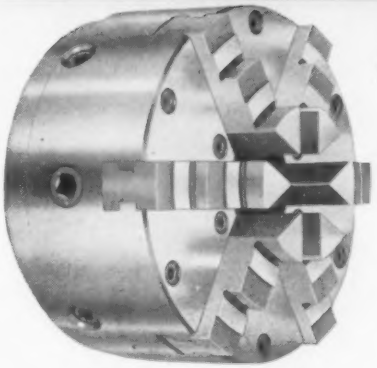
According to the company, this metal cleaner meets six basic requirements: it cleans the work with no traces of soil to reduce the effectiveness of the enamel finish; it provides maximum long life for economy and uniformity; it creates little or no sludge to keep costs and maintenance time low; it possesses high emulsification power; it affords low surface tension for thorough rinsing power; and gives top cleaning efficiency even under hard water conditions.

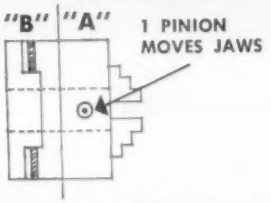
In operating tests of Detrex 63 it was discovered that in an aqueous solution of from six to eight ounces per gallon it may be boiled continuously without any depreciable effect on the concentration of the compound in solution.

When used by vitreous enamelers, the cleaner is recommended for work requiring removal of nonpigmented drawing and stamping compounds, mineral and vegetable oils and grease, and quenching oils from ferrous parts prior to the enameling operation.

T-11-113

The UNIVERSAL Chuck with .0005 PRECISION!





HOW and WHY it Works

Chuck gripping section "A" is like any scroll chuck with one pinion to make jaws. (accurate to .003"). Section "B" shows how chuck "floats" on adapter (.020" clearance) where 4 opposed screws move chuck on adapter for adjustment to dead true precision. Jaws always come back within .0005" on duplicate work.

Buck AJUST-TRU CHUCKS

6 JAW 6" CHUCK HANDLES WORK OF 93 COLLETS!

The capacity of $1,000 worth of collets for your tool room PLUS scroll chuck rechucking speed on duplicate parts with .0005" precision . . .

The firm grip of 6 jaws for soft metal or tube work . . .

An end to most needs for stub arbors, mandrels, or special fixtures . . .

A reliable precision chuck adaptable to lathes, screw machines, grinders, dividing heads . . .

The greatest development of recent years to save machinists' time . . .

That's the brief story of this sensational Ajust-Tru chuck. It is unbelievable — but true! Send for catalog with full details.

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3- and 6-Jaw Chuck—4" (light duty); 5", 6", 7½" (heavy duty)
2-Jaw Aviation Chuck—6", 7½" (heavy duty)

BUCK TOOL CO.

1133 Schippers Lane • Kalamazoo, Mich.

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NOW! WILTON PowRarm has 1000 lbs. Capacity

PowRarm 302 is ideal for
- heavy electronic assembly work
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- machining operations

or horizontally.

it's maneuverable
heavy work loads can be easily repositioned under partial tension.

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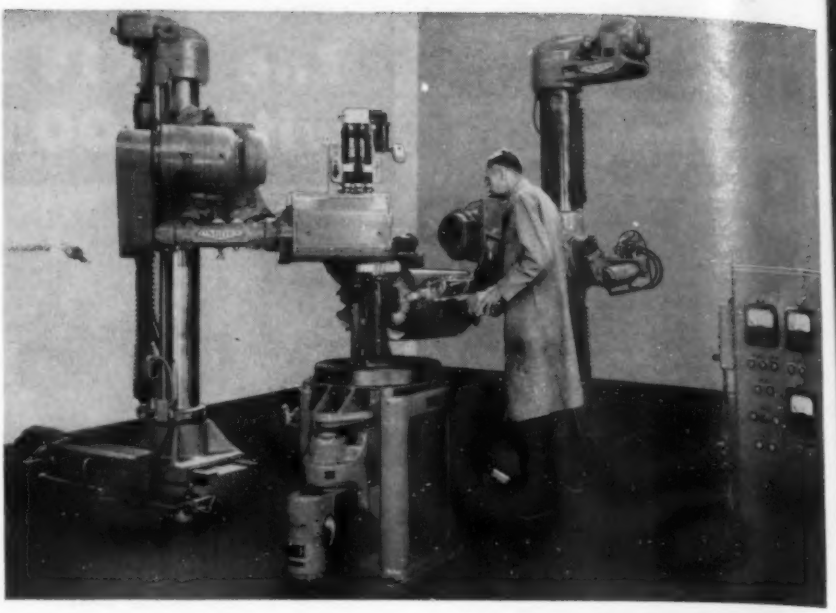
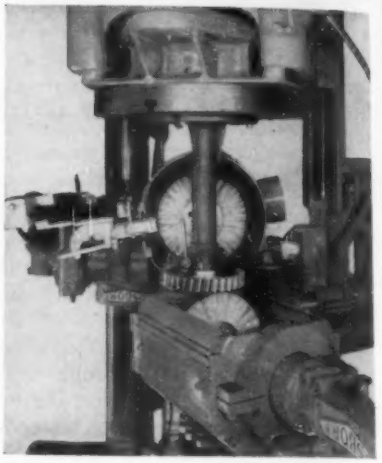
Gear Brushing Machine

With its Model 5 brushing machine, The Osborn Manufacturing Co., Cleveland, has introduced a different method for deburring large sized gears and similar products which illustrates the adaptability, versatility and economy of power brushing for this and other mass production operations. The machine, which offers many automatic features, not only steps up production to about ten times the work output, but also is said to present a finished product of higher quality.

The entire job of the operator of the No. 5 machine is completed with the placing of the workpiece on the turntable, until the work is brushed and ready to be removed. A pre-set timer retracts the brushing heads and motion is stopped until again actuated by the operator. The amount, direction





Close-up photo gives clear view of the operation being carried on in the picture at top.

and quality of brushing each gear receives depends on the type of gear, metal, surface desired and type and methods of application of the brushes. Therefore, the operator simply loads and unloads, all other operations can be pre-determined and pre-set.

The method avoids time consuming hand work normally involved in polishing, burring and finishing small parts. In addition, this machine is easily learned by an unskilled operator who can attain high quality and rapid production quickly.

While removing the burrs, brushes can produce smooth surfaces and well rounded edges simultaneously, which blend the joining surfaces properly. Brushing blends tool and grinding marks and helps reduce the number of potential points for small cracks. Though these may not cause complete fracture, they will result in small burrs and metal breaking off that will foul the lubrication system and cause unnecessary wear. T-11-1141

Minneapolis-Honeywell discovered the way to change-over to ...

RAHN

BLACK GRANITE SURFACE PLATES

AT

No Cost

THESE MEN AT MINNEAPOLIS-HONEYWELL CONCEIVED THE PLAN:

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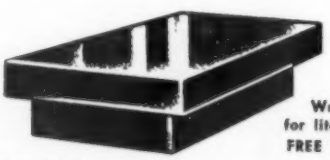
HERE'S HOW THEY'RE DOING IT ...

"We decided to classify our surface plates as Class A, B or C, according to their condition of wear. Then, instead of re-scraping plates as they become worn, we step-them-down to less accurate work. The money we've saved has paid for our installation of Rahn Black Granite Surface Plates."



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FREE TRIAL

You too will find it profitable!

DON'T SCRAPE worn surface plates
DON'T SCRAP them either ...

step-them-down for use on less accurate work. You'll save enough to replace with Rahn Granite Plates for precise work.

RAHN GRANITE SURFACE PLATE CO. 635 N. Western Av., Dayton 7, Ohio

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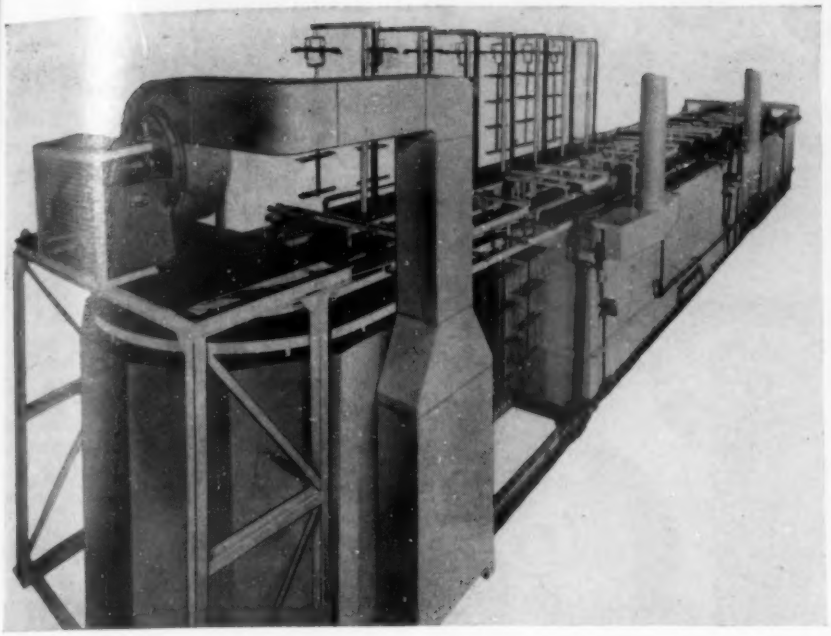
chanism consists of a singl drive shaft



Automatic Plating Machine

A complete plating unit is offered in the presentation by Wagner Brothers, Inc. of their unusually designed fully automatic vertical transfer return type plating machine. The transfer and conveying principle used give this unit its unusual status; it has no elevating superstructure, no transfer cams, no chains and sprockets and no hydraulic cylinders above tanks.

The machine consists of a base, the various necessary processing tanks, conveying and transfer mechanism, work carriers, necessary anode and cathode bars, hydraulic equipment and controls. It is prefabricated completely to customer's specifications and can be shipped assembled in one piece or in sections which may be joined together easily at the destination.

In operation, all complicated motions have been avoided, retaining only two basic ones to perform all operations: one forward and reverse straight line horizontal motion, and one raising and lowering vertical motion. The carriage, which is located between two rows of tanks, elevates and carries the work from station to station, keeping the work progressing through the station tanks, and moving the work from one side of the machine to the other.

Plating racks are hooked on the work carriers at the loading station. Until the cycle begins the carriers rest on two rails and are independent of the transfer mechanism. When started, the carriage moves in a reverse direction until a lifting arm fixed on the carriage engages the work carrier. The lifting arms on one side of the carriage are then actuated and lift the work carriers at all transfer points on one side of the machine. The carriage moves forward to the next station, the lifting arms deposit the carriers being transferred, and release them. On the other side of the machines, the opposite motions are taking place—on one side, the lifting arms are being raised, on the other, lifting arms are being lowered. In this manner, work progresses in one direction on one side of the machine, and in the opposite direction on the other side.

In a multiple station tank, the carrier remains supported on two rails progressing through the tank by means of pushers attached to the carriage and moved by its motion. Should the station be an electrified tank, the rails act as anode and cothode bars. The two points of contact of the carrier with these bars assure an unbroken flow of current to the parts, reducing the possibility of misplate and, consequently, the number of rejects.

As to construction, the elevating me-

NEW

CARBIDE TOOL FINISHING METHOD

Hammond CARBIDE BELT FINISHER

NOW — it is possible to final-finish single-point carbide tools

Without diamond wheels
Without highly skilled operators

Here is a NEW METHOD AND NEW MACHINE which have been proved in actual production. The Hammond Model 454 Carbide Belt Finisher is for final finishing with an abrasive belt after rough grinding with a silicon carbide wheel. It features —

Model 454
Carbide Belt Finisher

TUNGSTEN CARBIDE FACED PLATEN

Permits finishing the end, top and side clearance angles of single point tools.

CONVENTIONAL TABLE

Nothing new for operators to learn. One setting for all size tools.

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Hammond Machinery Builders INC.

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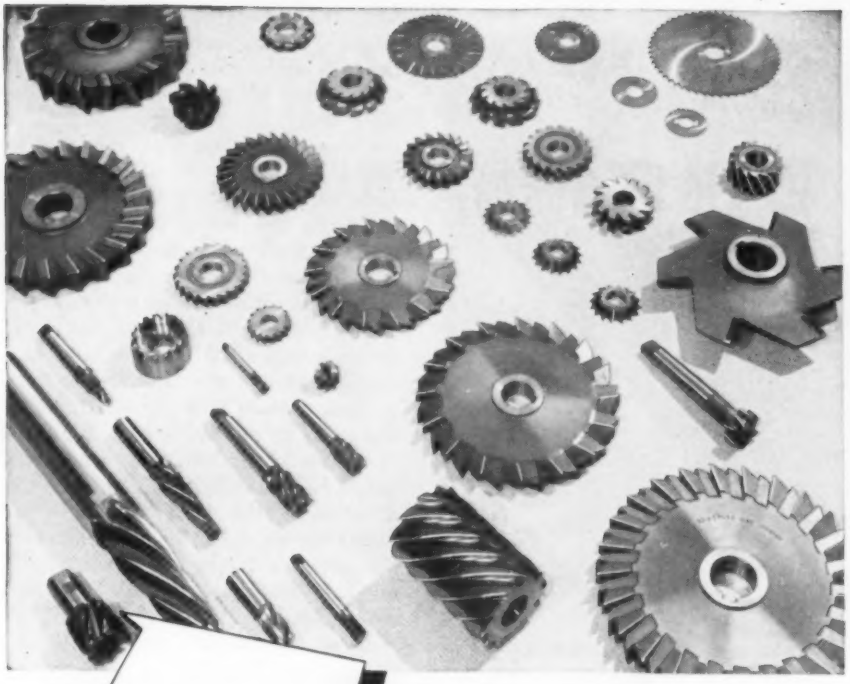
FINE PITCH HOBS



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For profitable solutions to production milling problems, call on Gorham! Over thirty years' experience in creating fine cutting tools is your assurance of satisfaction.

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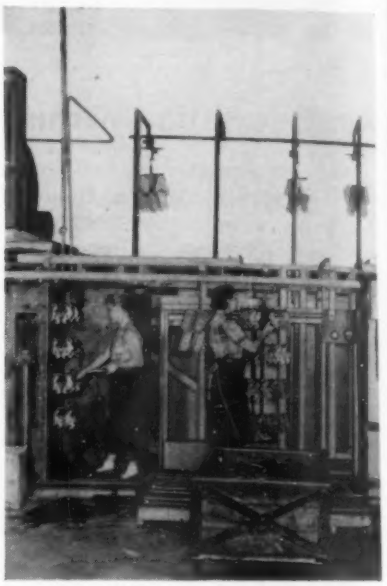
chanism consists of a single drive shaft, bearings attached to vertical support members, lifting pinions, rack and lifting arm assembly, and guide bars for the rack. The drive shaft is directly geared to a Hydromotor which imparts to it a two directional rotary movement. The entire mechanism is mounted at the top of the carriage and is accessible for maintenance and lubrication without removing the tank.

A hydraulic cylinder, mounted at the load and unload station, imparts horizontal motion to the carriage. Here too, location considers easy inspection and maintenance.

Two sets of controls govern production and cycle time. Adjustable hydraulic flow control valves cover the speed of each movement, while adjustable electric interval timers provide any



Girls working on the machine demonstrate ease of operation.

time hesitation desired at the end of each basic movement. This makes for sufficient flexibility to meet various time problems encountered in plating. Interval timers can be set to cause hesitation at the end of a lifting movement if reduced drag-out is desirable to allow time for the solution to drain from a part. It even is possible to increase the dwell time on one side of the machine and decrease it on the other by properly adjusting the interval timer.

Though the needs of most plating applications would be met by the machine as described as a standard, special devices can be incorporated to provide for a process requiring a very short immersion time at any one station, or even for one which requires skipping a station. A two shaft machine may also be supplied when very low rack per hour production or when extremely fast transfer time is necessary. **T-11-1161**

Dial-set Automatic

The Cleveland Automatic Machine Co., Cincinnati 12, have added a new

"Cool" Coolant

A water soluble true chemical solution which is completely free of oil and thus cannot be classified with other cutting oil and emulsion types of coolants, has been developed by Dynamic Industrial Products, Inc., Danbury, Conn.

Known as "Dypral" Safety Coolant, the solution is a cold blue, transparent, general purpose material. Among its main advantages, is its all-purpose usefulness which allows application for cutting, sawing and grinding, thus simplifying procurement and inventory because it necessitates purchase of a single coolant rather than several types.

Another primary attribute of Dypral is its ability to control temperatures. This makes it probably the coolest of the coolants, and assures high dimensional accuracy of parts, for they can be accurately measured at the machine and will not show a change in dimension later. Due to the fact that this coolant keeps the cutting edge of the tool cool, the tool is protected from decarburization with resultant reduction in both down time and tool expense. Further, tools and wheels need less frequent sharpening and dressing, cutting is improved and production increased. Too, life of dressing tool diamonds is lengthened.

Efficiency of the coolant is not reduced by cutting and frictional heat due to high stability. Its ability to dissipate heat and to act as a lubricant always produces a clean white chip. Both workpiece and tool remain cool and can be handled readily with bare hands, which has important implications, since only cold chips flow from the work surface.

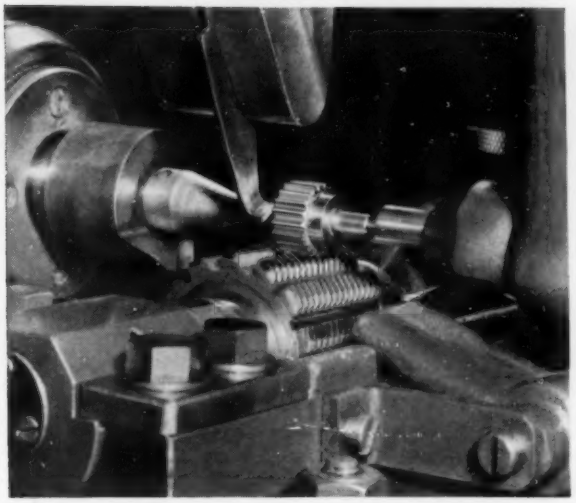
Being an aqueous solution, Dypral does not hold small metal chips and dirt in suspension; therefore circulating lines stay clean with the solution flowing freely. Due to grinding dust not being recirculated, grinding wheels remain in free cutting condition for metal is removed quickly and surfaces are saved from scratches.

Since the coolant is free from oil, parts leave the machine where they have been sawed, ground or cut clean and with no need for a degreasing operation. If desirable, plain water will remove the transparent, non-staining rust inhibiting film remaining on the tool.

Freezing temperature does not damage the safety coolant. Though the concentrated solution may become slightly viscous, efficiency is unaffected when the concentrate is brought back to normal temperature. In addition, lack of oil or other flammable liquid makes the solution safe from fire without special storage protection. **T-11-1171**

FINE PITCH HOBS

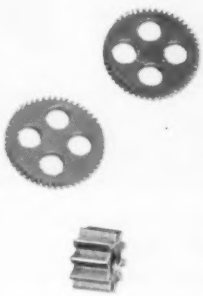
FOR PRODUCTION HOBBING

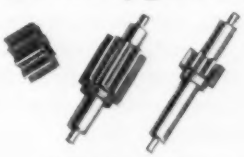


OF PRECISION FINE PITCH GEARS UP TO 270 DIAMETRAL PITCH

Barber-Colman Hob Engineers have developed special techniques for manufacturing hobs as fine as 270 pitch. These fine pitch hobs can be supplied to meet your specific accuracy requirements, ranging from Class AA to Class C tolerances, depending upon pitch.

Continuous development by Barber-Colman engineers with both Hobs and Hobbing Machines has resulted in standard production techniques for gears in this pitch range. Most of these gears are cut on Barber-Colman No. 1½ and 6-10 Hobbing Machines, or for maximum accuracy on No. 6-10 Precision Machines. Gear tolerances of .0003" total composite error, and .0002" tooth-to-tooth composite error, are now possible in these finer pitches. When you require small, fine pitch gears in high production with close limits of accuracy, call your Barber-Colman representative for assistance. With the precision and engineering built into the hobs and machines, he can help you reduce these requirements to ordinary gear cutting procedure.





Write For a Copy of Facts About Fine Pitch Hobs

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 71911 ROCK STREET, ROCKFORD, ILLINOIS

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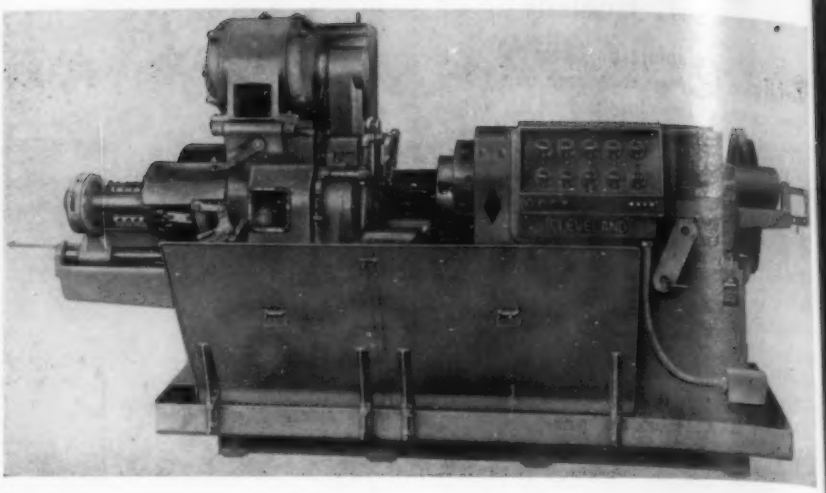
Automatic Turret Drill

Dial-set Automatic



The Cleveland Automatic Machine Co., Cincinnati 12, have added a new automatic to their line. The 4¼-inch capacity machine, known as the model AB, Cleveland Dialmatic, is equipped with the Cleveland designed electric feed drive which provides separate, infinitely adjustable forward and return motions of each of the five turret stations. This drive is controlled by ten dialed rheostats and a rotary timing switch with ten selector contacts. In setting up, when spindle speeds have been set and the desired rate of feed for each tool determined, the operator refers to the conveniently located feed chart which gives him the proper dial setting for each rheostat. Then, setting the feeds becomes simply a "dial-tuning" proposition.

The spindle head of the unit is a thick walled casting, accurately bored and planed, and is tongued, doweled and securely bolted to the bed. The forged steel spindle is mounted on Timken precision bearings. The 56 spindle speeds available range from 21 to 648 rpm while the 4 automatic speed changes for each speed range are made possible through the four-speed spindle motor. A hand-shift clutch provides two speed ranges for each set of gears.

The Meehanite tool turret is accurately ground to size and hard scraped to a large bearing. The five turret holes are bored in line with the work spindle, and each hole is provided with clamping bushings to hold tools securely. Smooth, rapid, check-free indexing is accomplished by the use of a Geneva indexing mechanism.

Separate front and rear cross slides are independently operated by separate, easily adjustable cam drums. The slides are rugged and have wide flame-hardened tool surfaces. Micrometer dials provide quick, precise setting of tools.

The length of stock feed is easily preset by a simple hand crank adjustment and registered on a scale.

A motorized chip conveyor is available which removes the chips through an opening under the spindle head at the stock feed end of the machine.

A second machine, the AW, combines the same construction as the AB, but differs in the type of feed drive utilized. The AW provides variable forward and return feeds through an improved, simplified mechanical drive. An independent motor furnishes the power and drives through a thoroughly time-tested friction drive unit. Changes of feed, to meet exact needs of each operation, are automatically controlled by adjustable steel cams on the regulating wheel. Adjustable trip pins govern the length of feed for each tool and make it possible to return the turret in idle motion when return feeds are not required.

T-11-1181

NOW increased production and long life . . .

with

"HARD-BUSHED"

DESTACO

TOGGLE CLAMPS

This is *new*—Destaco's new clamp design which gives you *hardened* bushings in all series 210, 220, 228 and 240 toggle clamps. The new bushings run full length through the clamp bars for a *larger* bearing surface—and they're deeply serrated to lock in position with no chance of turning in the bars. You get a minimum of wear, smooth, accurate snap action, even under tough production conditions. A feature of our heavier series for some years, this development sets new standards for tooling requiring 500 to 800 lbs. pressures. Further improvements have been incorporated in the "wrap around" construction which strengthens the base.

For any fast clamping action in milling, drilling, welding, bonding, molding, riveting or bolted assembly operations—specify Destaco Toggle Clamps for pressures up to 4000 lbs. Consult our stocking representatives in your area, or select from our 36-page catalog describing over 45 models. Write for his name and your copy today.

DESTACO **DETROIT STAMPING COMPANY**

328 Midland Avenue • Detroit 3, Michigan

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-118

Carbide Threading Tool

Included in the line of standard carbide tipped tools produced by Super Tool Co., 21650 Hoover Rd., Detroit 13, is an off-center threading tool.

This tool, identified as type ETS, provides for 60-degree threading of work closer to the shoulder than with conventional tools.

The ETS is available from stock in seven sizes from 3/16 to 3/4-inch shank. Circular No. 531, presenting complete details about the line of turning, facing, boring and threading tools, including the ETS, is available from the company. **T-11-1182**

How to get...

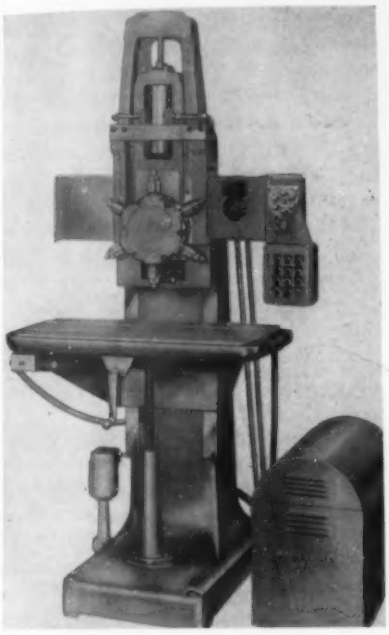
Feeding Device

Automatic Turret Drill

Outstanding feature of the six-spindle automatic turret drill recently introduced by Burg Tool Mfg. Co., is the infinitely variable hydraulic feed which can be manually controlled for automatic operations. The increased efficiency of this model enables one operator to operate one or more machines at the same time.

Known as Model 23H, this universal type production machine incorporates the advanced engineering designs of the improved Burgmaster Model 2A as well as adding other features to further efficiency and increase production.

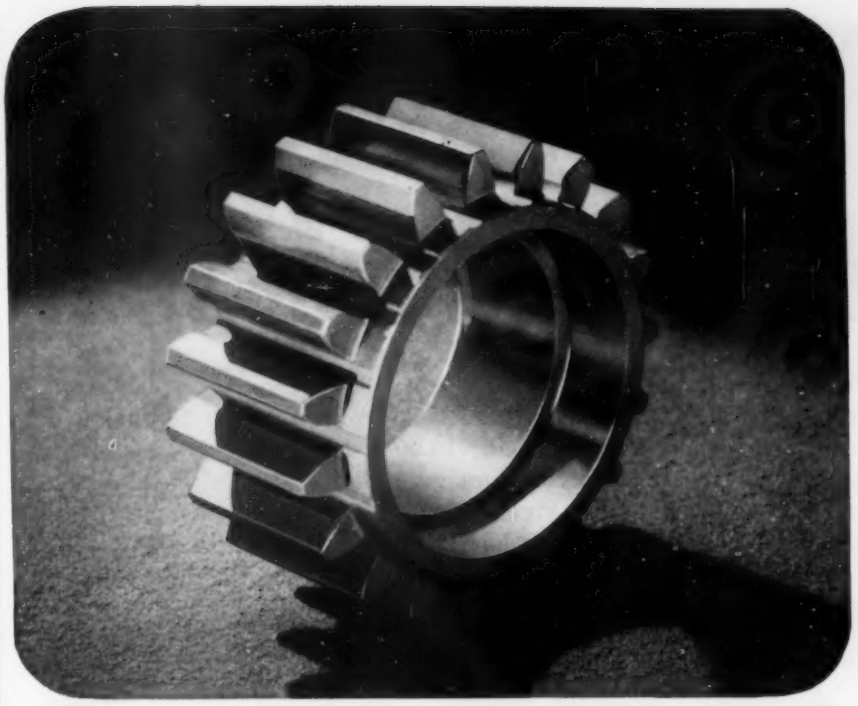
These include infinitely variable feeds to meet exacting specifications desired;



12 preselective spindle speeds available for each spindle; simple control to enable operators to work efficiently and without fatigue; precision double ball bearing spindles to insure long, trouble-free and smooth operation. In addition, the 19-inch table travel with large work table allows large or small parts to be performed on this one machine; and positive depth stops can be easily set, preselective to each spindle. Traverse is away from work for tapping; rapid traverse to starting, when tapping is not performed. The cycle then is rapid traverse to predetermined point, feed to depth, rapid traverse away from work. Skip indexing eliminates loss of time where four or five tools are used.

For complete information write to the company, 3743 Durango Ave., Los Angeles 34. **T-11-1191**

USE READER SERVICE CARD ON PAGE 131 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION



IN ONLY 3½ DAYS

"PUTTIN'-ON-TOOL"

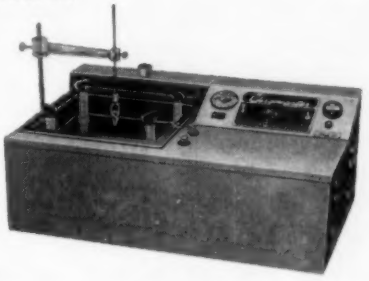
saves leading press manufacturer $2100 on spur gears

The bore diameter of flame-hardened precision gears like the one above used to be a costly problem for R. Hoe & Co., Inc., one of the leading manufacturers of large newspaper presses.

Constant orders for this particular gear, each specifying the bore diameter to extremely close tolerances, had to be met. Since manufacturing costs exceed $26.00 per gear, neither making up specials—nor annealing, reboring, and rehardening—was an economical solution. What HOE needed was a "puttin'-on-tool."

That's exactly what they have in their new Chromaster Industrial Chrome Plating Unit, which they use to adjust the bore diameter of stock gears to specification. Recently in a 3½ day period they were able to plate 81 of these gears with chrome deposits ranging from .0002" to .005" at a saving of $2100.

Chromaster can save you money, too. Write us.



CHROMASTER SALVAGES undersized parts, worn tools and gages right in your own shop. It's so simple to operate that no previous plating experience is needed. The chemically stable plating solution is deposited at a rate of .002" per hour for a cost of 7 mils per sq. in. One of six models will meet the requirements of every shop.

Chromaster

Industrial Chrome Plating Units 20, 50, 150, 250, 500 and 1000 amp. units

Ward Leonard Electric Co.
Industrial Chrome Division
13 South Street,
Mount Vernon, N. Y.

Please send me information on industrial chrome plating with CHROMASTER.

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NAME_____ TITLE_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-119

Frequency Converter

How to get...

Production Plus

Darwin **PRK • 33 TOOL STEEL**

Proven production increases of 50% to 1330%* are the "plus" from proper applications of Darwin PRK-33 Tool Steel. Its unique composition of added 3.3% Cobalt, 13.00% Chromium, Nickel, Manganese, Silicon and Molybdenum give PRK-33 stainless and non-corrosive qualities—**plus, rigorous durability.** If you are now using standard 150 carbon, air-hardening, high carbon, high chrome tool steel and need even greater production runs, write or call today for further information on "production plus" from PRK-33.

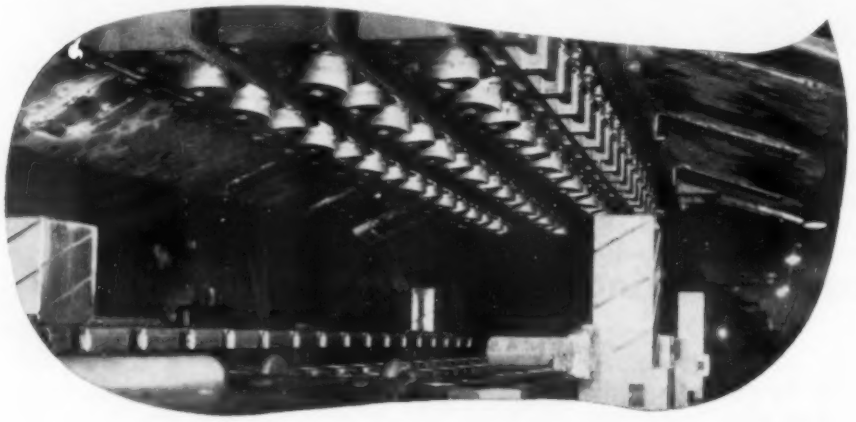

Illustration shows production of aircraft landing mats with PRK-33 stamping dies. Records show approximately 4 carloads stamped per day, period of over 90 continuous days—without need of regrinding or redressing.

* PRK-33 USERS REPORT

Drawing Dies—Philadelphia concern did over 60,000 pieces per grind, against previous best record of 16,000.

Hot Coining Dies—Increased production from previous high of 7,000 pieces to 100,000 (1330% increase) without sign of heat or wear cracks.

Knurling Tools—Beats not only High Carbon—High Chrome but also High Speed Steels in many cases. One case reports 50% better than High Speed Steels.

Complete line of highest grade Tool Steels, including NEOR, MINEOR, OHT, "MT6" and various grades of Hot Work Steel. Furnished in bar stock, billet, sand casting. Drill rod, flat ground stock, tool bits. Bulletin on request.

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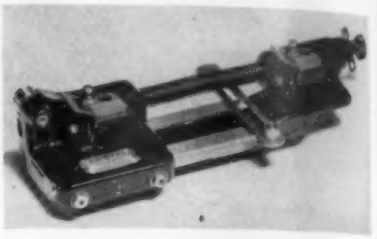
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-120

Feeding Device

The recently introduced Model K Hitch Feed, made by the H. E. Dickerman Mfg. Co., 321 Albany St., Springfield, Mass., features a heavy, semisteel main frame and moving member, as well as increased feed lengths. The design retains the grip per plate principle proven positive and accurate over many years. Feed lengths up to 2½ inches



will attain, as well as feed stock thickness up to 0.031-inch maximum. Stock insertion or removal is performed instantly, without tools. The new feed may either be mounted on the die set or attached to the bolster, to feed from any direction, and two or more may be used to feed separate ribbons from different directions to be worked and assembled in the die. **T-11-1201**

Small Bushing Extractor

An improved bushing and bearing extractor has been perfected by the Crozier Machine Tool Co., 684 North Prairie Ave., Hawthorne, Calif.

It consists of ten threaded expanding arbors, a draw table, and can handle the extraction from any hole from ¼ to 25/32-inch ID.

It was primarily designed at the request of aircraft, automotive and electronic production men, to provide a quick, easy method of removing bushings, bearings, sleeves, liners and similar units without shock or damage to the delicate equipment from which they must be separated.

The series 100, as it has been designated, is available with a choice of single, two, four, or ten expanding arbors to a set. **T-11-1202**

FORMING FACTS

72% SAVING IN METAL!

80% INCREASE IN PRODUCTION!

UNIQUE BALANCE CO., INC.

typical results by every user of

NILSON 4-SLIDE

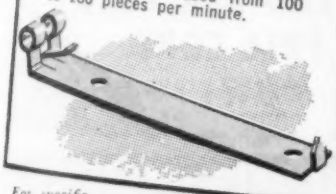
Wire and Ribbon Metal

FORMING MACHINES

You, too, can enjoy tremendous economies **at once.** NILSON combination press and 4-slide forming machines take the stock directly from the coil — feed, straighten, pierce, blank, swage, stamp, coin — perform up to 5 forming operations and cut off . . . all in one quick, precise operation AUTOMATICALLY!

USING A NILSON COMBINATION PRESS AND 4-SLIDE FORMING MACHINE,

Unique Balance Co., Inc. (one of the largest manufacturers of sash balance equipment), now produces 71,532 more parts out of the same amount of steel, compared to their former method. Production speeds increased from 100 to 180 pieces per minute.



For specific recommendations, send prints or samples of your operation when requesting bulletin.

THERE'S NOTHING LIKE A NILSON

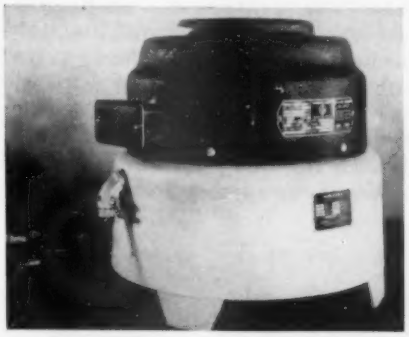
THE A. H. NILSON MACHINE CO.
1520 Railroad Ave., Bridgeport, Conn.

Automatic Chain-Making Machines • Automatic Staple Forming Machines • Wire and Stock Reels • Foot Presses • Wire Straightening Equipment • Slide Feeds for Presses

INDICATE A-11-121-1

Frequency Converter

A convenient and compact motor-generator unit to convert 60 cycles to 400 cycles has been developed by Geor-ator Corp., Manassas, Va., in response to the increasing demand for 400 cycles for high-speed motors, small hand-held power tools, aircraft and military applications and electronic devices. Unusual efficiency, compactness, long life, durability and reduced maintenance are



said to be achieved by the use of "No-brush" construction. Because the unit requires minimum maintenance, has reduced heating and is very compact, it may be placed in localities impractical for other types.

Outputs of 150 volt-ampere to 25 kva single or three phase are available with motor drive for any standard frequency or voltage. The compact, vertical, two bearing unit, which takes little more room than the conventional motor alone, is available in a number of sizes within this range. **T-11-1211**

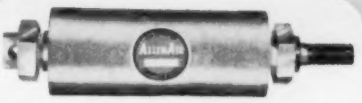
Burring Machine

A power-belt grinder offered by United Machine Tool Co. is designed to deburr, grind and polish the inside and outside surfaces with equal ease. The unit is available in both bench and portable models, equipped with automatic belt tension, sealed bearing idler pulley and platen backing on one side for flat surface work, and unbacked belt on opposite side for contour polishing.

Bench models have 110-v motors—1/3 hp single horizontal arm, and ½ hp single horizontal arm, double horizontal arm, double vertical arm, or vertical and horizontal arm adjustable clockwise to 12 operating positions. All bench models use 42x1-inch belts with commercially available abrasives. Will work in holes 1¾ inches or over.

The portable hand grinder attachment is furnished with 1.150-inch standard mounting hole (or varied to suit) to fit popular makes of hand grinders. Descriptive literature is available from the company, 1912 Clyde Park Ave. S.W., Grand Rapids, Mich. **T-11-1212**

ALLENAIR



CYLINDERS
• AIR • WATER
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AIR VALVES AND CLAMPS

INDEXING DIAL FEED TABLES WITH POSITIVE LOCK FEATURE

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The A. K. ALLEN CO.
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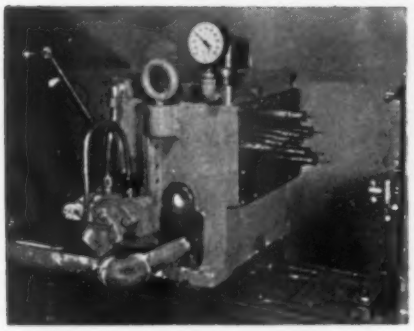
INDICATE A-11-121-2



An ultra precision multi-spindle head of a unique design adaptable to an Excello, Heald or Stoker-Unit Horizontal-Precision Boring Machine.

One ten thousandth tolerance on diameters of bores and plus or minus one ten thousandth tolerance on center distance between bores.

These special heads will cut your direct labor costs and increase production per machine.

Send in your inquiries for further information.

Designers and manufacturers of tools, dies, gages, fixtures, special machines, optical checking equipment and precision instrumentation parts.

PIONEER TOOL & ENG. CO.

3914-18 W. Shakespeare Ave.

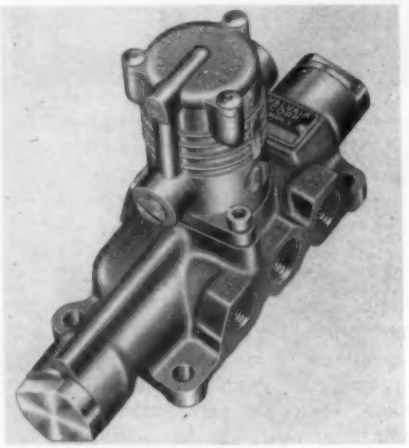
Chicago 47, Illinois

INDICATE A-11-122-1

Solenoid Valve

A line of solenoid pilot-operated air control valves is available from Valvair Corp., Morgan Ave., Akron 11, Ohio, for 3-way, 4-way and 4-way 5 port (two pressure) application in pipe sizes of ¼ through 1 inch. All types and sizes are furnished either for foot mounting or sub-base manifold mounting in accordance with JIC specifications.

All parts are noncorrosive. The main valve body, and also the sub-base, is cast bronze. The spool is stainless steel, hard chrome-plated and polished to assure long life to the special hycar O ring seals. An interesting point is that there is no spring in the main valve, since air from the pilot valve is utilized to reverse the spool in both directions.



The spool is the one moving part of the main valve body, and all parts are easily accessible without disturbing the piping to the valve.

The pilot valve control unit is manifolded with cap screws to the main valve body. An optional manual override is available for the pilot valve, which makes operation possible when electric current is off or when cylinder control setups are of importance. All parts of the pilot valve are totally enclosed to give the complete valve a dustproof and splash-proof protection.

The solenoid coil is replaceable and is available in any alternating current voltage and cycle, including all direct current requirements. Maximum current consumption at any voltage is only 10 watts, assuring cool operation and long life at operating speeds as high as 600 cycles per minute. The solenoid can be held energized for any length of time without overheating and is applicable for constant or intermittent duty.

The exhaust port is common for both the pilot and main valve, being the next pipe size larger than the inlet and cylinder ports to assure fast cylinder exhaust. **T-11-1221**

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JIG & FIXTURE COMPONENTS

Finest Quality Standards for Your Tooling Program at New Low Prices!

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INDICATE A-11-122-2

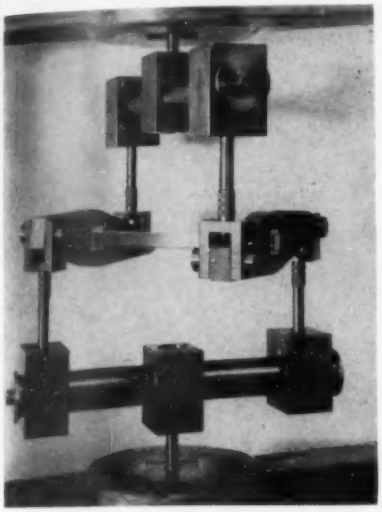
Automatic Air Drill

The Hause Holomatic drilling un

Torsion Test Device

To produce pure torsion on a tension testing machine, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa., announces the Schaevitz torsion device.

Test specimens up to ¾ inch square and ranging from 2 to 12 inches long, plus 2 inches to be engaged by torque bars, can be twisted to a maximum angle of 24 degrees. Maximum torque load is 60,000 inch-pounds, obtained by applying a 12,000-lb tension load. The



new Schaevitz torsion device is furnished with hardened socket liners for specimens ⅜, ½, ⅝, and ¾ inch square or for round specimens with square ends of these sizes. Other sizes of liners are available on special order.

Ends of test specimens are secured in the centers of two parallel torque bars. Torque bars are rotated in opposite directions by means of four tension members that are pivotally connected in the ends of two equalizer bars. Pivotal connections are provided also for two spherically headed tension rods that are seated in wedge block adapters in the machine crossheads. **T-11-1231**

Unusual Clamp

A recently patented principle in clamping which is said to permit extreme throat depth without sacrificing strength involves a 6-inch clamp with a 5½-inch throat depth. The item is made by Centinela Industrial Supply Co., 11930 Inglewood Ave., Hawthorne, Calif.

This unit, incorporating the recently announced Saxton principle, applies straight-line force at point of clamping, thereby avoiding stress and strain hazards often found in methods of deep throat clamping. It combines the main features of standard drop forged C clamp and a toolmaker's parallel clamp. By the use of a torque converting, spring-bearing trunnion in the new clamp, distorting, twisting action is eliminated. The trunnion absorbs vibration, and assures a firm, steady grip throughout milling, routing, and shaping operations. There is no unsupported screw or loose pad to "walk" off the center when pressure is applied against the anvil. The horizontal position of the screw (at all openings) provides access to the work area never before achieved, according to Mr. Maxson.

This 4-lb unit, which is produced from roll forged steel, has an added feature in its ability to grip rounds, flats, and nonparallel surfaces or any combination. The spatter-free position of the screw has virtually eliminated the necessity for special shields or compounds in welding operations. **T-11-1232**

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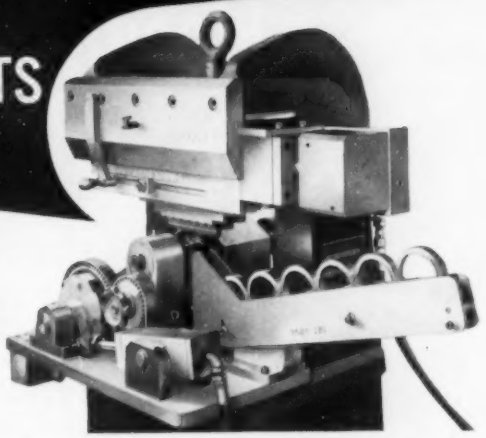
YOU CAN CUT MARKING COSTS WITH... GTS

GEO. T. SCHMIDT AUTOMATIC FEEDS



In many applications, thousands of components per hour are marked, with GTS automatic marking equipment. Feeding mechanisms are designed for a specific operation, custom tailored to suit your requirements.

Perhaps GTS specialists can design automatic equipment to solve your marking problems.

A trained marking engineer is at your disposal to help you modernize your marking operations and cut costs to a minimum.

MODEL 175 HYDRAULIC

GTS The unit illustrated above marks the perifery of bearing races at the rate of 2400 to 3000 per hour. It is fed directly from automatic screw machines, and requires no operator.

IF IT'S WORTH MAKING, IT'S WORTH MARKING.

GEO. T. SCHMIDT, INC.
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Chicago 13, Illinois

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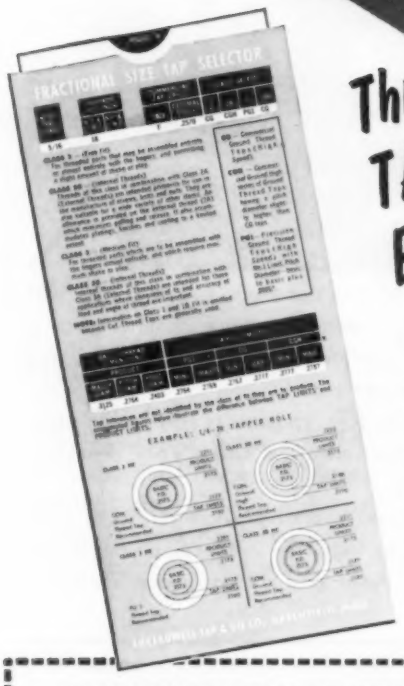
Metal Fabricator

Leading Stamping Plants,



Threadwell's New
TAP SELECTOR
Brings Results, too!

Based on the latest Unified and American Screw Thread data, this spectacular Tap Selector makes it easy for every user of taps to select the proper tap for the job . . . and boost production, too! It's the most complete Selector ever offered, and it's FREE for the asking. Your Threadwell Distributor has it. Mail the coupon and we'll see he gets yours to you.

Threadwell

THREADWELL TAP & DIE CO.
GREENFIELD, MASS. U.S.A.

I'd like.....copies of the new Tap Selector.

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COMPANY _____

STREET _____

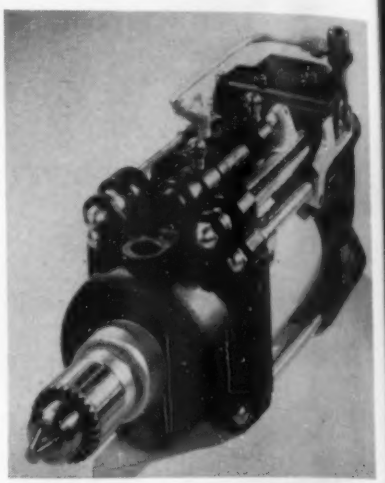
CITY _____ ZONE _____ STATE _____

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-124

Automatic Air Drill

The Hause Holomatic drilling unit, which weighs only 30 pounds, accomplishes single and multiple feed rate operations. Powered by compressed air, hydraulically fed, it is said to be suitable for either automatic or manual cycle control.

Stroke is adjustable to four inches with ample thrust for ½-inch diameter drilling in steel. Positive stop with a dwell or instantaneous retract operation; continuous cycling, skip drilling, back feeding and manual jogging are easily achieved.



Rotary Air motors, in capacities to ¾ horsepower and speeds of 500 to 15,000 rpm, give the Model 14 Hause Holomatic an extremely wide working range. Hause Holomatic drill units can be arranged to suit all requirements, and can be mounted in horizontal, vertical or angular planes.

Complete details are presented in a brochure available from Hause Engineering, Montpelier, Ohio. **T-11-1241**

Sealant

Tincher Products Co., Sycamore, Ill., has announced a plastic seal, which is supposed to seal "coarse" porosity and even squirters, as the latest addition to their line of seals and equipment for the treatment of porous pressure castings. Marketed under the tradename Imprex, this seal is said to have excellent penetration properties which assure wall-to-wall impregnation. Company engineers explain that the seal's low shrinkage factor enables sealing to be permanent and positive.

Among the seal's advantages is the fact that it is soluble in water, therefore requiring no dangerous and expensive solvents for cleaning casting after impregnation. Further no special handling or storage is necessary. **T-11-1242**

Internal Keyseater

The Internal Keyseater, slotter and

to 5 inches in length, and a full 360 degrees in angle. Interchangeable tool heads provide clapper action, rigid

Metal Fabricator

The Model 10-AA sheet metal fabricator, just announced by the Wales-Strippit Corp., North Tonawanda, N.Y., punches, notches and nibbles, operating with a minimum of vibration and noise at 165 strokes per minute for single hole punching and for nibbling. A main feature of the unit, the Hydra-New-Matic head, is unusual in its simplicity of design and operation.

Rapid interchangeability for punching, potching and nibbling is one of the outstanding features of this machine. Operators work from blueprints or operation sheets without requiring templates. For example, the 1¼ holder,

which incorporates the Wales "Quick Change" system permits 10-second changing of punches and dies for punching various round and shaped holes up to 1¼ inches in diameter. Wales 3½ holder provides for punching various round and shaped holes up to 3½ inches in diameter, and only requires the interchanging of the punch tip, stripping plate and die.

By merely placing an independent, self-contained notching unit on the fabricator bed table, notching operations are immediately performed without any ram adjustments. Wales Type "NG" notching units are equipped with built-in scales and gages adjustable up to 5 inches for corner notches.

Further, all types of nibbling are made possible with Wales Model 10-AA fabricator. A nibble lever controls the nonrepeat device for continuous, uninterrupted ram operation while nibbling. **T-11-1251**

USE READER SERVICE CARD ON PAGE 131 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Leading Stamping Plants, Warehouses and Steel Mills NOW use . . .

FLEX-TESTER

FOR NON-DESTRUCTIVE TESTING OF SHEET METAL FOR DRAWING QUALITIES AND STRETCHER STRAIN

DEVELOPED BY JONES & LAUGHLIN STEEL CORP.
SOLD EXCLUSIVELY BY STEEL CITY

FLEX-TESTER does its job quickly. Can be used to select sheets suitable for forming desired part. User can save better material for more severe draws; use poorer grade for simpler work. Enables application of material of uniform quality. Determines need for roller leveling, particularly on exposed panels where stretcher strain is detrimental. Hand operated; light weight; easily carried. Proven in use on hundreds of jobs. Write for descriptive bulletin or demonstration in your plant.

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Steel City Testing Machines Inc.

8805 LYNDON, DETROIT 21, MICH.

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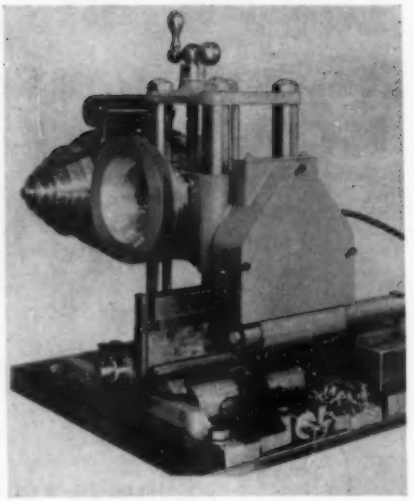
Automatic Deburrer

MORE of this

Internal Keyseater

The Internal Keyseater, slotter and shaper, which has been introduced by Versa-Mil Co., 33 West 42nd St., New York 36, adds reciprocating tool action to the wide range of precision machining which the company has offered. Like the other tools, it permits use as a portable independent tool, which can be taken to the work.

The Keyseater will cut internal keyways from ⅛ to 1 inch in width, in bores from ½-inch diameter to any required size. Or it can be set on a lathe carriage, so that the keyway may be cut in the same setup in which a hub is bored. It also may be used as a portable slotter or shaper, and as a bench shaper.



Its operation is normally as a draw shaper, but where accessibility is limited, as in a blind keyway, a flip of a switch and a quick change of the toolholder will adapt it for "push" shaping. Stroke is adjustable from 0 to 5 inches in length, and a full 360 degrees in angle. Interchangeable tool heads provide clapper action, which relieves the tool bit on the return stroke.

An oil reservoir provides automatic lubrication for every rotating and sliding surface. The dovetail slide, which guides the stroke, is adjusted for fit by a tapered gib. The rocker arm and all toolholders are hardened steel. The tool bar is carburized, hardened, and ground on outer surface and tapered socket for toolholders. The bronze ram, the slide ways, and the gib are hand-scraped for fit. The rigidity and close fits combine to produce cuts controlled in width to tolerances within 0.001 inch.

According to the maker, keyways 4½ inches long have been made in SAE No. 1020 steel using a ½-inch wide cutter bit and averaging 0.007 inch per stroke. Wider cuts are made either by moving the tool, or changing to wider tool bits after making a ½-inch cut to required depth. **T-11-1261**

Pencil Grinder

What is considered to be the smallest and lightest pencil grinder on the market, is now being produced and marketed by Nu-Jett Products, 1335 Michigan, N.E., Grand Rapids, Mich.

The air-driven grinder, which will operate on pressures of 50 lb or more, develops speeds up to 110,000 rpm. It uses the principle of opposed spirals, which run the full length of the barrel and rotor. This features gives the high speed and operating efficiency of this 4-oz grinder.

Because of the high speed, it is particularly adapted to carbide burs. At the same time it has been found that abrasive wheels last three times as long due to the speed.

Simple in design, the only moving parts are the rotor and two ball bearings. These are standard and can be quickly replaced if necessary. Exhaust air from the grinder comes out the front end, keeping all dust blown away from the work. **T-11-1262**

Drill Grinder with ⅜ inch capacity holder on left and 2½ inch on right side. Can also be furnished with a general purpose grinding wheel on left end instead of the small drill holder. Also available for wet grinding.

A POINT TO REMEMBER

A drill point that is sharp and correctly ground will—

(1) drill to exact size
(2) drill faster
(3) drill more holes per grind
(4) require less power
(5) reduce breakage
(6) cost less to regrind
(7) increase life of drill as less metal is removed each time drill is sharpened.

Bench type Drill Grinder with ⅜ inch capacity holder. Also made in 1¼ inch capacity Pedestal type.

It naturally follows that a Drill Grinder will quickly pay for itself in increased production and lower cost direct and indirect labor.

Write for catalog 72 EJ today!

Hisey THE HISEY-WOLF MACHINE CO.
CINCINNATI 8, OHIO
Division of The Cincinnati Electrical Tool Co.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-126

HANSELL-ELCOCK

Automatic Deburrer

Simultaneous deburring and chamfering of both front and back faces of holes in sheet metal, plate, extrusions, casting, and forgings is possible with the Noburmatic tool, made by the Noburr Mfg. Co., 717 N. Victory Blvd., Burbank, Calif. The simple, high-speed tool is said to produce uniform quality deburring with consistent accuracy, even on rugged production line operations.

The tool may be used either in portable drill motors, or in stationary machine tools such as drill presses and turret lathes. The automatic action de-

burrs the front face of the metal during the entry of the tool in the hole, and the rear side is deburred during the withdrawal cycle. Independent controls are provided for setting of working depth (or chamfer) of both front and rear cutters. On many jobs, the tool is said to reach back side surfaces that would otherwise be inaccessible.

Two models are offered: Model GCN, for nonferrous metals and other relatively soft materials; and Model GCF, for ferrous metals and relatively tough-working materials. Standard models are available in individual tool sizes corresponding to drill gages from 1/8-inch diameter (0.0125) to "F" (0.257).

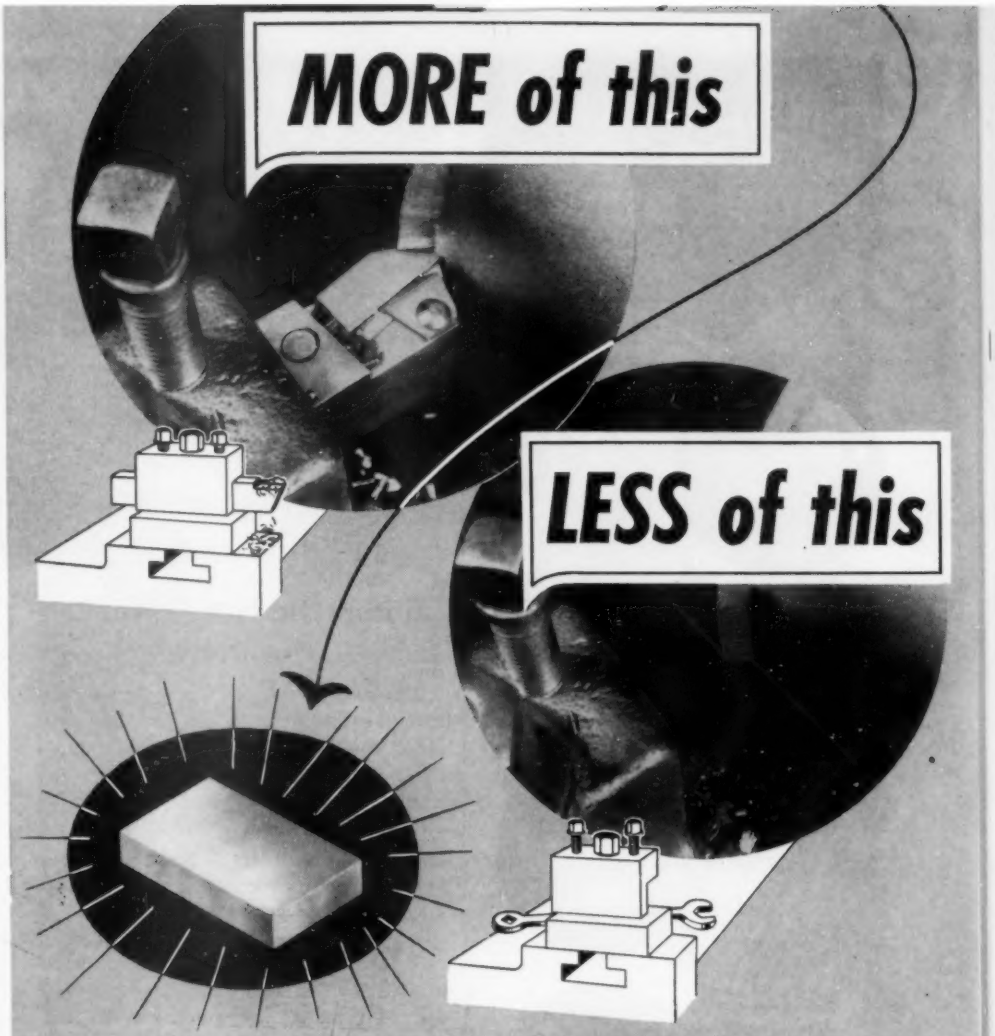
The Noburmatic tool is available for immediately delivery. Complete information and free descriptive folder may be obtained by writing the company.

T-11-1271

Chrome Plating

A chrome plating concentrated solution, Chromasol No. 2, intended for use with self-contained Chromaster industrial chrome plating units, has been developed by the Industrial Chrome Div. of Ward Leonard Electric Co., Mount Vernon, N. Y. This solution has deposit hardness characteristics said to be comparable to any conventional chrome plate above the file hard range. It can be applied to most metals in deposit thicknesses of 0.015 inch or more. These features of exceptional hardness, heavy deposits, high abrasion resistance and ease of application, make it especially useful for salvaging worn or undersize parts, gages and tools.

Chromasol No. 2 solution is prepared for use simply by adding three parts water to one of concentrate. **T-11-1272**



How to Reduce "LOST-BUT-PAID-FOR" HOURS

Shut down of a machine for tool change does not shut off operating expense. Production stops, but costs run on.

There's a way to minimize this non-productive time . . . Kennametal tools seldom need replacement — hours on the machine, minutes being reground.

Kennametal is "different" — ingredients, compositions, processing. The resultant distinctive characteristics are utilized to a maximum degree in novel tool designs — especially the clamped-on technique — in which we pioneered.

How Kennametal reduces Lost-but-Paid-for-Hours is disclosed by case studies in periodically-issued Performance Reports, and can be demonstrated in your own plant. Such information and help is yours for the asking. Kennametal Inc., Latrobe, Pa.

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THAT INCREASES PRODUCTIVITY

Belt Attachment

The Adapt-A-Belt, an unusually uni-

WHX

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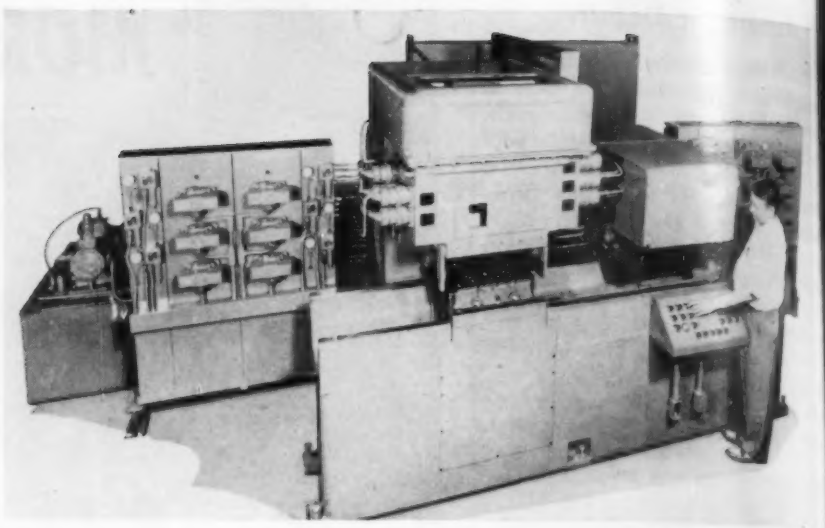
INDICATE A-11-128



Automatic Nut Torquing Machines

Automatic nut-torquing assembly machines designed to cut assembly line labor costs and improve product quality of bolted assemblies have been introduced by Hautau Engineering Co., 721 Wanda, Ferndale 20, Mich.

These hydraulic powered multiple spindle machines are supposed to automatically tighten a nut or bolt to a given torque specification, tighten a bolt to a specified elongation, or drive a stud to a given depth. Further, they are said to act as automatic gaging machines and reduce scrap since individual spindles will not drive bolts, studs or nuts if their thread fits exceed specified tolerances or if the fastener is improperly started.

Torque capacities of the machines are from 35 to 120,000 in. lb. Torque specifications, it is stated, can be held within a two percent tolerance; length or elongation within 0.0004 in. The machines are fully adapted to transfer type mass production assembly lines.

Prime feature of the machines is a patented drive in which each spindle is powered by a hydraulic fluid motor. The motor is either direct-connected to the torquing spindle or a double-enveloping cone-drive worm gear set is provided in the drive, depending on the torque requirements.

When driving a bolt, stud or nut, the hydraulic motor is run initially at low pressure and low speed, thus providing a low torque drive and assuring positive engagement between the fastener and the rotating spindle sockets. The initial low torque prevents driving of improperly fitted or cross-threaded fasteners. When the sockets have engaged the fasteners, an increased volume of oil is then directed to the fluid motors, which rotates the spindles at high speed, providing a fast rundown. When the fastener is within one or two turns of depth, a valve is actuated by a depth control finger, which directs a high pressure, low volume oil flow to the hydraulic motor. Thus a high torque, slow speed drive is provided.

If the fastener is being tightened to a given torque setting, the hydraulic motor is stalled out at the desired torque setting. The torque setting of the drive is adjustable to meet a wide variety of torque specifications. After the motor has been operated at stall torque for a fraction of a second, the flow of oil to the motor is reversed under low pressure to free the spindle-driving socket from the fastener, completing the torquing operation. Then the part is retracted from the spindles and ejected from the machine.

If the fastener is being driven to a given depth or being tightened to a specified elongation, gaging devices shut off the fluid motor.

The machine illustrated tightens ten main bearing cap screws on an automotive engine block. It works in conjunction with an in-line conveyor and has an auxiliary head that presses in ten dowel pins in the bearing caps ahead of the nut torquing operation.

At any given time there are three blocks in the machine: One having the dowels pressed, one waiting to be torqued and one being torqued. The cap screws are torqued to 1080 in.-lb by the machine. Cycle time for the complete pressing and torquing operation is 24 seconds.

The complete machine is 20 ft long, 11 ft deep and 8 ft high overall.

T-11-1281

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Balancing For Mass Production
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6411 River Parkway
Dept. E11, Milwaukee 13, Wis.

INDICATE A-11-129-1

Belt Attachment

The Adapt-A-Belt, an unusually universal attachment, has been placed on the market by Curtis Machine Corp., Jamestown, N. Y. The device, which may be employed on a wide variety of grinding and polishing operations, is made for use as a portable grinder attached to an air outlet or to clamp on lathes, milling machines, drill presses or pedestal grinders to do work quickly on jobs that do not warrant setting up a machine.

Advantages of the Adapt-A-Belt include the use of dynamically balanced

rubber covered contact wheels in various diameters, widths, and durometer, as well as soft or hard cloth wheels. It is of rigid lightweight steel construction and complete simplicity in universal attaching clamps, abrasive belt tracking mechanism with efficient belt tensioning. Grinding can be done with either end or slack belt. **T-11-1291**

Soapstone Holder

Welders, metal workers, and others engaged in work in which metal marking is essential, may be interested in the useful soapstone holder offered by See-Line Co., Inc., 618 Amarillo Bldg., Amarillo, Tex. Known as the See-Line soapstone holder, the tool weighs only 3 ounces, is easy to see, even through welders' goggles, and practically eliminates loss from soapstone breakage. For convenience, a strong, durable clip is attached. It also has an automatic locking device which makes the soapstone adjustable to any length for different marking conditions. **T-11-1292**

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THE answer to this over-whelming preference lies in the way IDEAL Live Centers are built . . . in their micrometer accuracy and their bulldozer durability. Their unique construction makes them practically vibration-free and deflection-free. Short overhang and precision-type bearings insure the utmost rigidity in turning. All parts are hardened and precision ground. Special seals keep out chips, coolant and other foreign matter. It's this *built-in* performance that makes them a 4-to-1 favorite.

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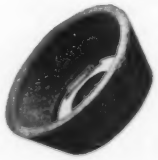
INDICATE A-11-129-2

The cost man figures they're money-makers!

SIMONDS ABRASIVE CO.

Grinding Wheels



Any way he figures it . . . production per wheel-dollar, less down time, fewer rejects . . . Simonds Grinding Wheels pay-off. You, too, can get satisfaction, savings and long productive service in these quality controlled wheels. Right now they're proving their value throughout every phase of industrial grinding in terms of top output, accurate performance and consistently superior results. Complete line includes grinding wheels, mounted wheels and points, segments and abrasive grain . . . all available through your Simonds distributor.

Write for free data book and name of your Simonds distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

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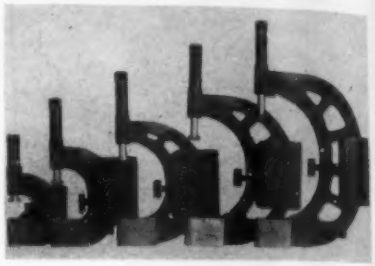
Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N.Y. Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-130

Contact Air Snap Gage

An adjustable air snap gage, made by Federal Products Corp., Providence, R. I., is said to differ in operating principle from other air snaps because it is a contact type gage; therefore, the workpiece is positioned directly on the flat, tungsten carbide gage anvils, and the user can feel when the piece is in the gaging head correctly. The air jet does not contact the workpiece but, instead is located in the sensitive anvil assembly. The frictionless movement of this anvil is read on the dial of Federal's Dimensionair, an instrument



which gives a direct reading to the nearest 0.00005 inch.

The wide adjustment of this air snap gage makes it possible to cover a capacity from 0 to 6 inches with only five sizes. A large amount of overtravel protects the gage from jamming caused by oversize parts and an insulating handle eliminates the chance of error through heat transfer from the operator's hand.

According to the manufacturer, the main performance characteristics of this gage are exceptional accuracy and sensitivity combined with speed of operation. Also, since it is very thin, it can easily measure between narrow shoulders. **T-11-1301**

Grease-Fitting Cover

Dirt and other abrasives may be kept from entering grease fittings as a result of an item being produced by the Winner Mfg. Co., Box 945, Fort Wayne 1, Ind.

The Zur-Kap, made of oil-resistant neoprene, is designed for use on all pieces of equipment using either Zerk- or Alemite-type fittings, to avoid excessive wear from dirt particles normally forced into the unprotected fittings during application of new grease.

T-11-1302

THE TOOL ENGINEER'S Service Bureau

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	DESCRIPTION
A-11-250-1	Alpha Tool Works	**Presses**—New folder completely describes the Alpha 100-ton die tryout press. Describes how press can be altered for easy access to die during tryout. (Page 250)
A-11-169	American Broach & Machine Co.	**Broaches**—Catalog No. 300 completely illustrates and describes the American surface broaching machines. (Page 169)
A-11-162	F. E. Anderson Oil Co.	**Coolants**—Booklet "Lusol Gets to the Point" gives many case histories of satisfied users and explains how Lusol's rapid cooling permits higher-speed machining. (Page 162)
A-11-117	Barber-Colman Co.	**Hobbing Machines**—Booklet "Facts" gives information on how to increase production of fine pitch hobs for production hobbing. Describes techniques for making fine pitch hobs. (Page 117)
A-11-236	Behr-Manning Corp.	**Polishing Machines**—New booklet describes how to economize in metal polishing operations. Describes the various types of grinding wheels and discusses the many variables in polishing. (Page 236)
A-11-187	Bryant Chucking Grinder Co.	**I.D. Grinder**—Booklet "Alignment" discusses features of a general purpose hole grinding machine. Described is a method of straightening wheel slide ways to straighten the wheel path. (Page 187)
A-11-29	The Cincinnati Shaper Co.	**Press Brakes**—Seventy-two page Catalog B-4 gives full facts on forming large diameter and tapered pipes and tubes. (Page 29)
A-11-180-2	Colonial Bushings, Inc.	**Drill Bushings**—Free catalog gives complete data on drill jig bushings for the benefit of designers. (Page 180)
A-11-213	Crane Packing Co.	**Lappers**—Full facts on Lapmaster production lapping and flatness interpretations are available in two illustrated booklets. (Page 213)
A-11-153	Guthery Machine Tool Corp.	**Automatic Screw Machines**—New thirty-two page catalog describes nomenclature and operation of Traub automatic screw machines and turning and copying automatics. (Page 153)
A-11-134	Handy & Harman	**Brazing Rod**—Bulletin 20 gives case histories describing how brazing problems were solved by manufacturers. (Page 134)
A-11-5	Hardinge Bros., Inc.	**Collets**—Bulletin 50 gives various tapers and spindle sizes available and describes types available for various machines. (Page 11)
A-11-158	The B. Jahn Mfg. Co.	**Progressive Dies**—A pictorial brochure states the economies involved and speeds attained by applying progressive die methods for manufacturing complex parts. (Page 158)
A-11-182-1	Kaufman Manufacturing Co.	**Tapping Machines**—Catalog No. 1153 describes nomenclature, construction and operation of automatic single or multiple spindle head tapping machines. (Page 182)
A-11-152	Keller Tool Co.	**Air Tools**—A free 36-page booklet describes the variety of handles, gearings, speeds and angle attachments for hand operated screw driving and nut setting tools. (Page 152)
A-11-32	Kling Bros. Engineering Works	**Presses**—Bulletin No. 347 points out the variety of jobs performed by the combination shear-coper and presents case histories of satisfied users. (Page 32)
A-11-9	Landis Machine Co.	**Thread Chasers**—Bulletin F-90 fully describes the application of tapping heads to industrial hose couplings, valves and straight pipes, and gives the variety of sizes available. (Page 9)

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A-11-13	Lapointe Machine Tool Co.	**Broaching Machines**—Bulletin S.R.H.E.-5 discusses stroke ranges and speeds, and gives case histories concerning the electro-mechanical drive Lapointe broaching machines. (Page 13)
A-11-203	Lindberg Engineering Co.	**Induction Heaters**—Bulletin 1440 pictures and describes standard models, illustrates eleven cost reducing features, lists applications and shows accessory equipment. (Page 203)
A-11-258	Lodding, Inc.	**Jig and Fixture Components**—Free Lodding catalog contains full scale layouts of fixture details and clamp assemblies, and explains how savings can be made with them. (Page 258)
A-11-209	Modern Tool Works Div. Consolidated Machine Tools Corp.	**Die Heads**—Bulletin No. M-124 indicates many advantages of Modern die heads, and lists sizes and special heads available. (Page 209)
A-11-232-1	Morton Machine Works	**Fixture Components**—A new seventy-two page catalog contains full size tracing templates of each product and explains how savings can be made by applying Morton components to jig and fixture problems. (Page 232)
A-11-228	The National Acme Co.	**Chaser Gages**—Completely new DT-52 catalog describes applications and benefits of the "Vers-o-tool" for checking finish grinding for chasers, and the Namco Solid and Collapsible Taps. (Page 228)
A-11-25	Norton Co.	**Surface Grinders**—Twelve-page catalog No. 190 describes the 8" by 24" Norton "Touch of Gold" surface grinder, and discusses weights and sizes of wheels, and accessories manufactured by the company. (Page 25)
A-11-249	The Ohio Crankshaft Co.	**Heat Treating**—A free bulletin explains how Tocco induction heating equipment has cut operating costs and raised production for various manufacturers. (Page 249)
A-11-244-4	Ready Tool Co.	**Centers**—Catalog B contains facts on pipe and bull nose centers; Catalog D discusses anti-friction centers and points out the values of high-speed carbide tipped centers. (Page 244)
A-11-195	Reynolds Metals Co.	**Aluminum Dies and Fixtures**—Brochure explains the economies derived by using cast aluminum plate for low production and experimental runs on tools, dies and fixtures. (Page 195)
A-11-252	Rotor Tool Co.	**Air Grinders**—Catalog No. 38 discusses savings obtained by customers using Roto air-operated grinders and shows the variety of grinding applications obtainable as well as cost saving. (Page 252)
A-11-137	Skinner Chuck Co.	**Chucks**—The Skinner line of power and manually operated chucking equipment with complete details on sizes available is given in the manual offered by this company. (Page 137)
A-11-19	The L. S. Starrett Co.	**Dial Indicators**—Starrett's catalog thoroughly describes and illustrates a large variety of indicators, comparators, portable dial hand gages and dial bench gages as well as giving specifications and useful data. (Page 19)
A-11-122-2	Standard Parts Co.	**Jig and Fixture Components**—New catalog contains 66 pages and 150 drawings of new sizes and parts, advanced engineering features and exclusive items not elsewhere available. (Page 122)
A-11-262	Super Tool Co.	**Carbide Tools**—New shadow indexed catalog contains 92 pages giving carbide tool sizes, engineering information on a line of solid carbides and new tools cataloged for the first time. (Page 262)

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Granite Layout Plate

A line of black granite layout plates has been developed to supplement surface plates manufactured by Collins Microflat Co. Differing from surface plates, the layout models do not have clamping edges, but are straight-sided.

The surfaces of the layout models are finished to an accuracy up to 0.0002 per foot, whereas the surfaces of Microflat surface plates are finished up to 50 millionths over-all. However, for layout purposes, many shops do not require the extreme accuracy for the majority of layout operations and the accuracy specifications of 0.0002 per foot is adequate. In addition, many inspection and layout operations do not require the use of clamp edges. By not saving edges as required for clamping, and by allowing more tolerance the manufacturing costs were reduced. The layout plates are more economical because less work is involved in producing and finishing them to 0.0002 per foot. They are said to have the same advantages as the regular line of Collins precision 2 and 4 clamp edge surface plates. Qualities include non rusting, non warping, non deflecting, easily

washable, smooth finish, temperature inert, rigid over-all and moisture repellent. Being black granite, they have no glare. They require no oiling and cannot corrode. If accidentally nicked, the surface accuracy is not impaired, as the surface will not rise around the nick.

A descriptive bulletin listing in sizes from 12 x 18 inches to 36 x 48 inches can be obtained from Collins Microflat Co., 2326 E. 8th St., Los Angeles 21, Calif. **T-10-1331**

Limit Switch

A new explosion-proof heavy duty precision limit switch, designed for use on all types of machinery and industrial equipment in explosive gas or vapor-air atmosphere, has been developed by the Micro Div. of Minneapolis-Honeywell Regulator Co., Freeport, Ill.

It is listed by Underwriters' Laboratories as suitable for hazardous locations of Class I, Group C and D.

Designated IMLI-EI, the switch is made so that the user may adjust the operating head to any of four horizontal positions. The roller arm assembly may be reversed to position the actuator roller on either side of the actuator arm. The roller arm is field adjustable to operate clockwise, counter-clockwise, or in both directions. The actuator arm assembly is adjustable through 360 degrees to any of 870 positive lock positions at intervals of 0.4 degrees.

Considered the smallest explosion-proof snap-action switch available, the switch case, including the adjustable head, measures six inches high, 2⅛ inches wide and 1 61/64 inches in depth.

The die cast aluminum enclosure has a ⅛-inch thick porous bronze plate fitted over the enclosure opening to vent the basic switch cavity and prevent any great pressure build-up in the cavity due to the ignition of explosive atmosphere present. The path through the plate also serves to extinguish the flame and cool the hot gases below the ignition point of the surrounding explosive atmosphere.

Underwriters' Laboratories list the switch for 20 amp, 110, 220 or 440 v a-c; ½ amp, 115 v d-c; ¼ amp, 230 v d-c; ¾ hp, 110 v a-c; 1½ hp, 220 v a-c. **T-10-1332**

. . . now L&I adds KING SIZE to its broader range of STANDARD reamers

LEE & IDE, INC. L&I

L&I Chucking Reamers in both Wire Gage and Letter Sizes are now STANDARD in long as well as short lengths. Other L&I exclusives include Dowel Pin Reamers, Right Hand Spiral Flute Reamers in Wire Gage Sizes. Complete line of sets, too. L&I King Size Reamers mean King Size Production.

L&I The Reamer Specialists

LAVALLEE & IDE, INC.
CHICOPEE, MASS.
INDICATE A-11-133

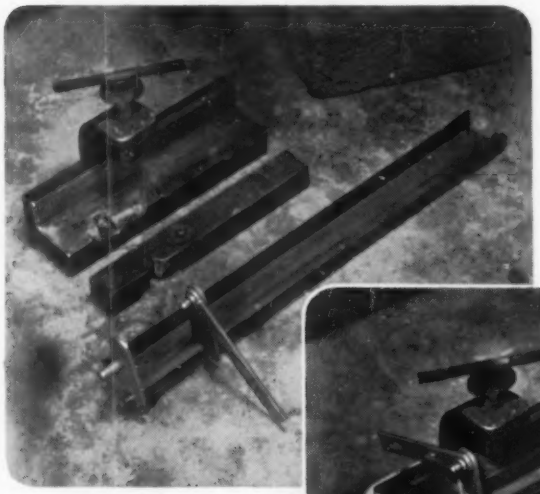
ATT: READER SERVICE DEPT.

BRAZE HARDENED PARTS SAFELY... with EASY-FLO

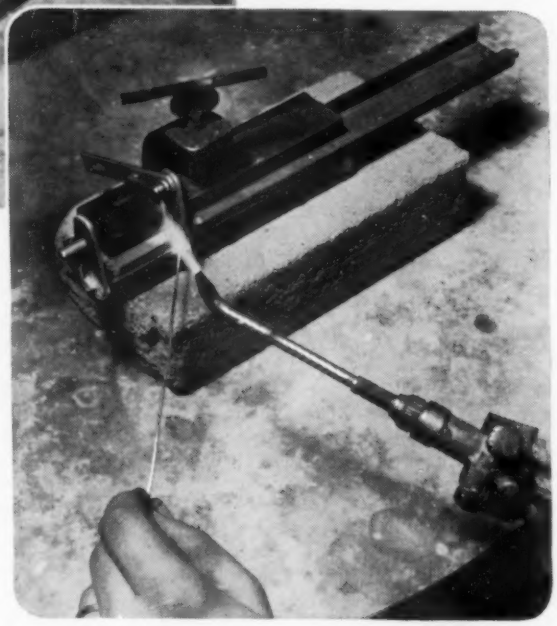
With EASY-FLO — the low-temperature silver brazing alloy — you can braze parts that have been hardened, without appreciably affecting their hardness. That's because EASY-FLO's low brazing temperature, plus its remarkably fast penetration the instant this temperature is reached, greatly reduce the amount of heat and the heating time required.

By using copper bars as "chill bars" to help dissipate the heat, you can make doubly sure of preserving the hardness of the parts.

HERE'S AN EXAMPLE— a hardened steel part of a ticket vending machine, brazed for the General Register Corp. by Salkover Metal Processing of New York, Inc., Long Island City, N. Y., metal joining specialists.



At left is a hardened steel machine part and the two brackets that are brazed to it; also two copper chill bars, one of which has a clamp screw.



At right you see the hardened assembly clamped between the two chill bars and the arm bracket being brazed to it with 3/64" EASY-FLO wire. Clamping assures the close contact needed for good conduction of heat to the chill bars. Both brackets are brazed with no appreciable change in the hardened surfaces.

FIND OUT WHAT **EASY-FLO BRAZING** WILL DO FOR YOU

BULLETIN 20 gives full details about the remarkable metal joining strength, speed and economy manufacturers everywhere are getting with EASY-FLO low-temperature silver alloy brazing. Write for a copy today.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-134

X-Ray Unit

The Andrex 250 kVp industrial X-ray unit which features complete portability (over-all weight, including the control unit, is less than 350 pounds) has been introduced by Holger Andreasen, Inc., 703 Market St., San Francisco. Its small size and light weight are the result of eliminating all high tension cables, cooling connections, separate transformers and cooling pumps. The X-ray tube and other high tension parts are combined in a single all-welded steel tank.

This 250 kVp unit will penetrate 4 inches of steel. The focal spot is 4 mm, and at a focus-film distance of 24 inches a 17 inch film is covered. Supply voltages are 110-220-440V (50-60 cycles).

Due to its radical type of construction, the Andrex is said to require little or no service. **T-11-134**

Lift Magnet

Departing from its usual manufacturing line of magnetic chucks, O. S. Walker Co., Inc. has introduced an industrial magnet which lifts up to 5,000 pounds. The line is offered as pound for pound and volume for volume, the strongest magnet made due to the fact that it is designed of material high in permeability and magnetized to complete saturation with equal flux distribution. The ratio between flux density and wattage results in no overheating and hence no lost time.

Square design provides for maximum contact area, and thus they require no additional manual labor. As an added advantage, the magnets may be successfully operated under water.

A bulletin describing the magnet is available from the company, Worcester 6, Mass. **T-11-134**

Chamfer Micrometer Gage

A chamfer micrometer gage has recently been introduced by Acme Industrial Co. The new instrument is designed to accurately read directly, end diameters of chamfers up to 1 inch from 0 degree chamfer to 90-degree included angle maximum chamfer. The depth of chamfer in a hole is also easily computed. This gage is a direct reading micrometer and can be read like any standard micrometer.

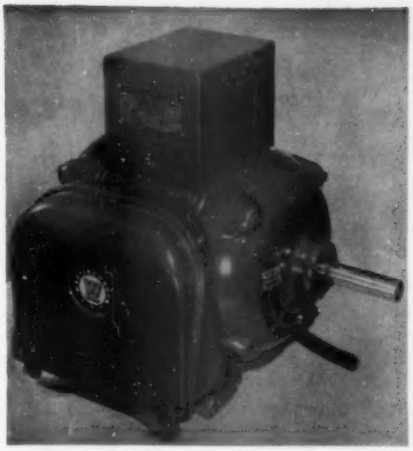
A master check bar with a known indicated end diameter and chamfer is furnished with each chamfer gage for checking the calibrations of the micrometer. Each gage is individually packaged in a protective felt-lined, varnished wood case. Further information and instructions for use may be obtained without obligation from the manufacturer, 200 N. Laflin St., Chicago 7, Ill. **T-11-1351**

Capacitor Motor

A single-phase motor that is both capacitor-start and capacitor-run is available from the Westinghouse Electric Corp. Called the type CAP-2, the motor is made in 5-, 7½-. and 10-hp ratings, and is a 4-pole, 220-volt, 60-cycle motor.

Capacitor-run motors operate very efficiently at near-unity power factor, and their design is such that starting current is reduced about 25 percent, with the same starting torque. The auxiliary winding remains in the circuit during operation and is in series with the running capacitors. Relays merely remove the starting capacitors when the motor approaches full speed. The main winding is directly across the line.

Elimination of the wound rotor, brushes, and commutator of the previous repulsion-induction design results in a simpler motor with less maintenance. It also eliminates sparking, a



cause of radio interference, and a possible fire hazard.

Where three-phase power is not available, this design will permit the use of larger single-phase motors for such applications as air-conditioning units, oil-well pumping, and many farm jobs such as hay and grain drying, and feed grinding.

For further information write to the company, P.O. Box 2099, Pittsburgh 30, Pa. **T-11-1352**

USE READER SERVICE CARD ON PAGE 131 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

From Milne
A COUPLE OF FAST ONES TO TRY ON YOUR TOOLING PROBLEMS—
MILNE'S
GRAPHITIC TOOL STEELS
Another Part Of Milne's Complete Line of Solid and Hollow Tool Steels.
ENTIRE LENGTH KOLORKOTED FOR QUICK, SURE, PERMANENT IDENTIFICATION.
GRAPH-MO
JIC—O6
Oil Hardening, Non-deforming
★ Faster, Easier Machining Than Standard Oil-Hardening Tool Steels
★ Extremely High Wear Resistance
Non Galling. Does Not Score Or Pick-up
Kolorkoted Pink & Gray
For forming, drawing, sizing, flanging, embossing, and combination dies, work support blades, forming rolls, machine parts, plug, thread and ring gauges, cams, bushings, mandrels, fixtures and other applications.
Manufactured By TIMKEN ROLLER BEARING CO.
GRAPH-TUNG
JIC—WW
Water or Brine Hardening
★ Extra High Resistance To Abrasive Wear
★ Remarkable Non-Seizing Properties
★ Easier Machining Than Other High Wear-Resistance Steels
Kolorkoted Purple & Gray
For deep draw dies, automotive body dies, cold shell-nosing dies, cold heading dies, draw punches, coining dies, lathe centers, blanking dies, blanking punches, cold heading quills, bar and tube draw dies, cold extrusion plungers and other uses.
Manufactured By TIMKEN ROLLER BEARING CO.
AM-12

Graph-Mo and Graph-Tung are a pair of faster-machining, longer-wearing tool steels that can help you cut tooling costs. In both, diamond-hard carbide particles guarantee super wear-resistance while free graphite insures faster, easier machining and non-seizing properties. Make Kolorkoted Graphitics from Milne standard for your tool room. Write Milne for free bulletins.

WAREHOUSES: NEW YORK, CHICAGO, BOSTON, NEW BRITAIN, CONN., PHILADELPHIA, PITTSBURGH, CLEVELAND, DAYTON, SAN FRANCISCO, ATLANTA

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Complete line of tool steels . . . Wide range of grades and sizes.

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Established 1897
745 WASHINGTON ST., NEW YORK 14, N.Y.
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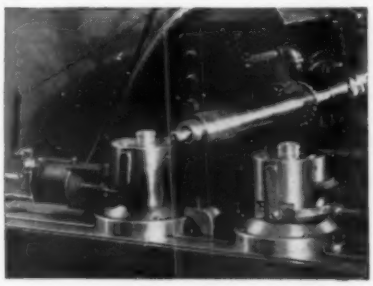
Complete Line Of Tool Steels—Hollow and Solid

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-135

Zagar 1" collet holding fixture cuts costs in center drilling shafts.

take a short cut—
depend upon Zagar-
holding and indexing fixtures
for milling, drilling,
tapping and grinding

"Skip" the many special set-ups, jigs and fixtures formerly needed to hold and index. Maintain accuracy and close tolerances. No vertical movement in closing. Stop insures exact duplication of parts. Pipe tap hole provides for lubrication of cutting tools and washes out chips. Index any number of positions from 2 to 25 (4, 6 and 8 divisions standard). 1" and 2" sizes.



Operator merely loads and unloads.

also, the Zagar-"Air-O"

Zagar "Air-O" (air-operated) fixture has all basic features above; still further speeds up operation. Control by hand, cam, chain or other cycling connection. All parts are interchangeable. Typical Zagar ruggedness and craftsmanship. 1" and 2" sizes.

* * *

Ask for Zagar Manual "E-11"

ZAGAR TOOL, INC.
24000 LAKELAND BLVD.
CLEVELAND 23, OHIO

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

INDICATE A-11-136-1

Who's Meeting - and Where

Nov. 2-6. American Institute of Electrical Engineers. Fall meeting, Hotel Muelbach, Kansas City, Mo. Contact Institute headquarters, 33 W. 39th St., New York 18, for more details.

Nov. 4-6. Industrial Management Society. Annual Time and Motion Study and Management Clinic, Sheraton Hotel, Chicago. More facts are available from association office, Pure Oil Bldg., 25 E. Wacker Dr., Chicago 1.

Nov. 4-6. Society of Automotive Engineers. National Fuels and Lubricants meeting, Conrad Hilton Hotel, Chicago. Write for more information to society headquarters, 29 W. 39th St., New York 18.

Nov. 4-6. Meehanite Research Annual Meeting, sponsored by the Meehanite Metal Corp., Hotel Cleveland in Cleveland. The company, 714 North Ave., New Rochelle, N. Y., can give further details.

Nov. 4-6. Steel Founders' Society of America. Annual T & O Conference, Hotel Carter, Cleveland. Society office, 920 Midland Bldg., Cleveland, can provide more information.

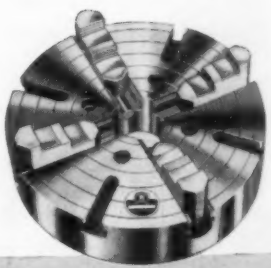
Nov. 9-12. Refrigeration Equipment Manufacturers Assn. Eighth Refrigeration and Air Conditioning Exposition, Public Auditorium, Cleveland. More information is available from the association office, 1346 Connecticut Ave., Washington 6, D. C.

Nov. 9-13. Montreal Tool and Industrial Equipment Show. Foremen's Club of Montreal, Show Mart, Berri Square, Montreal. Information is available from the association, 4585 Sherbrooke St. West, Montreal, or at 19 Melinda St., Toronto.

Nov. 10. Joint Industry Conference. Meeting to discuss rerating of electrical motors, Rackham Bldg., Detroit. For details, contact Mr. R. R. Mitchell, Box 182, Northend Station, Detroit 2.

Nov. 10-13. National Machine Tool Builders' Assn. Annual meeting, Boca Raton, Fla. More information may be had from Mrs. Frida F. Selbert, sec-

this name is your guarantee of dependable performance . . . backed by 102 years experience in the manufacture of the world's finest chucks.



See your Distributor for a complete line of chucks by Horton — pioneer in J-Type chucks for jet engine machining

HORTON Since 1851 CHUCK

DIVISION OF
THE E. HORTON & SON CO.
WINDSOR LOCKS, CONN.

INDICATE A-11-136-2

retary, at the association office, 10525 Carnegie Ave., Cleveland 6.

Nov. 12. NATIONAL ASSN. OF CORROSION ENGINEERS. Meeting, Birmingham, Ala. For details, contact the association office, 1061 M & M Bldg., Houston 2, Tex.

Nov. 17. ARMOUR RESEARCH FOUNDATION of Illinois Institute of Technology and the Trade Association Executives Forum of Chicago will co-sponsor a conference on trade association technical problems. Technology Center, Chicago. Obtain details from the Institute office, 35 W. 33rd St., Chicago 16.

Nov. 20. PURDUE UNIVERSITY. Conference to study methods of applying graphics to engineering problems. Write for information to Prof. J. Howard Porsch, General Engineering, at Purdue, West Lafayette, Ind.

Nov. 23-27. AMERICAN VOCATIONAL ASSN. 47th annual convention, Conrad Hilton Hotel, Chicago. Direct inquiries to Hobart H. Sommers, Chicago Board of Education, 228 N. LaSalle St., Chicago 1.

Nov. 29-Dec. 4. AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting, Statler Hotel, New York. Full information may be had from society office, 29 W. 39th St., New York 18.

Nov. 30-Dec. 5. CHEMICAL INDUSTRIES, 24th Exposition. Convention Hall, Philadelphia. Contact Exhibit Manager, Mr. E. K. Stevens, Grand Central Palace, 480 Lexington Ave., New York 17, for full details.

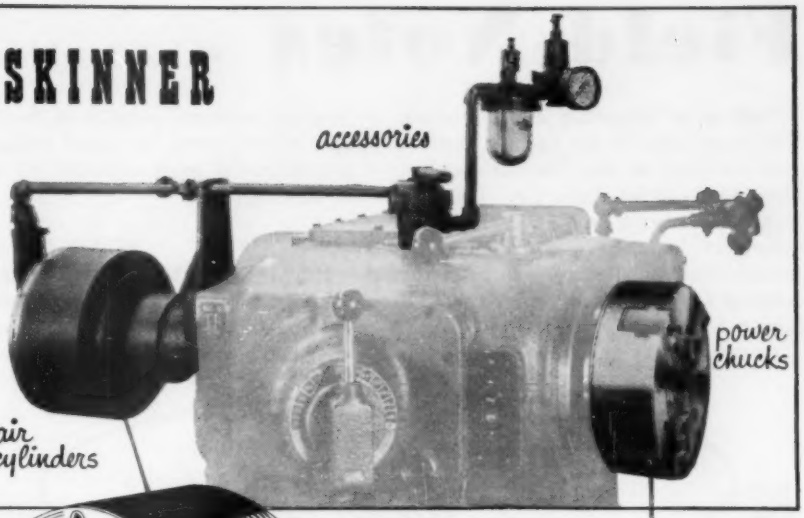
Dec. 3-4. SOCIETY OF THE PLASTICS INDUSTRY, INC. Fifth Film, Sheeting and Coated Fabrics Division conference, Commodore Hotel, New York. For more facts, write society office, 67 W. 44th St., New York 36.

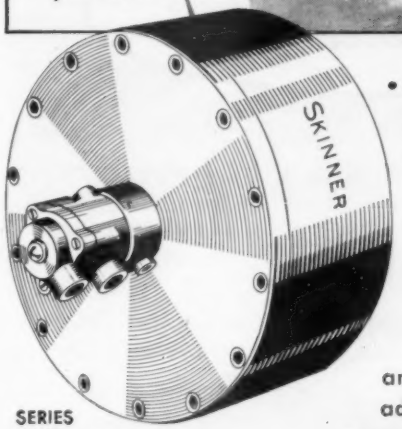
Jan. 11-15. SOCIETY OF AUTOMOTIVE ENGINEERS. Annual meeting, Sheraton Cadillac Hotel and Hotel Statler, Detroit. Write the society headquarters, 29 W. 39th St., New York 18, for full information.

Jan. 22. MALLEABLE FOUNDERS' SOCIETY. General meeting, Hotel Cleveland, in Cleveland. The society office, 1800 Union Commerce Bldg., Cleveland 14, can provide details.

Jan. 25-28. PLANT MAINTENANCE & ENGINEERING SHOW. International Amphitheatre, Chicago. For full information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

SKINNER





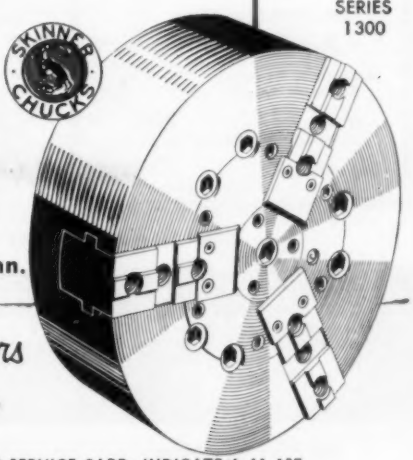
SERIES 2100

...for every high production need!

The Skinner line of power chucking equipment has the strength, rigidity and design features so essential for today's production needs. Chucks are available from 6" to 21" with forged steel bodies, and with either 2 or 3 adjustable or non-adjustable jaws. Exclusive sliding wedge construction grips internal or external work positively regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates the draw bar. Skinner double-acting rotating (series 2100 for speeds up to 1500 R. P. M.) and non-rotating air cylinders are available with semi-steel bodies for all sizes of Skinner power chucks, and for actuating all types of holding fixtures and tailstocks. Series 2200 double-acting rotating air cylinders have aluminum bodies for efficient operation up to 3000 spindle R. P. M. Skinner accessories include hand-operating valves — complete air unit, including regulating valve, pressure gage and lubricator — filters — soft blank top jaws; draw bars — draw tubes, etc.

Write for catalog giving complete details on the Skinner line of power and manually operated chucks. And ask about new movie "Chucks and Their Uses"—available for free showings.

SERIES 1300



THE SKINNER CHUCK COMPANY
212 Edgewood Ave., New Britain, Conn.

Sold by leading distributors in every industrial area

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-137

Field Notes . . .

Tubing of titanium and zirconium will be annealed in the vacuum furnace now installed at the Norristown, Pa., plant of Superior Tube Co. The new furnace is a batch type and can handle tubing in lengths up to 24 ft. The furnace was installed to help meet the demand for the line of small titanium tubing.

Because titanium presents metallurgical problems peculiar to itself, the task of producing the small tubing on a commercial basis required six years of development.

v v v

Edward K. How has been named manager of sales for General Electric's welding department. He was formerly sales manager of the G-E Locke Dept.

Production has started at the recently constructed plant in Tynemouth, England, of Armstrong Whitworth & Co., subsidiary of Thor Power Tool Co. Opening followed one of the reportedly biggest and fastest industrial transfers in the area's history when the entire former factory at Newcastle was transported to the new enlarged plant. The move was made in less than two weeks. The new factory offers 50 percent more manufacturing space and provides the latest in equipment, facilities and working conditions. Thor acquired the British subsidiary in 1951.

v v v

A contest is being sponsored by Elox Corp. of Michigan in connection with its recently introduced M-400 for the precision die market. Open to all industrial engineers, writers, editors and persons in allied fields, the competition is for suggestions which will speed development of wider applications for this piece of equipment. Two awards of $500 each will be made, one for the winning suggest on new applications, and the other for the best descriptive name for the M-400 model.

v v v

Expansion plans of its research facilities have been approved by the board of directors of E. F. Houghton & Co. The program will involve adding of another floor over the present research laboratory to provide required facilities for the program. The expansion is particularly aimed at four fields:

A new approach to the project of cutting fluids for modern machine tools;

Further study of chemical surface treatment of metals;

Expanded heat treatment program including new furnaces and research on new types of molten salt baths for treating steel and nonferrous metals;

Study on textile oils and synthetic processing agents for man-made fibers;

Construction is expected to begin sometime this fall.

v v v

With the wide use of tantalum, many industries will be interested in the announcement that tantalum strip, precision-rolled to close tolerances and to thin gages and foils is now available in quantities to 1,000 lb from the Industrial Div., American Silver Co., Inc. The strip is processed on precision 2-high, 4-high, and Sendzimir rolling mills (a 12-high cluster-type mill capable of rolling at 200 fpm.) Precision gang slitters do the final work.

ARDCOR *Engineered*

MEANS BETTER COLD-ROLL FORMING

The Production-WISE

ROLL FORMING MACHINE...

ARDCOR

MODEL 1-F

Spindle Diameter....	1½"
Roll Diameter.....4¼" to 7"	
Horizontal Distance Between Spindles..	12"
Roll Space on Standard Machine.	10"
Capacity Max.....	.072

ADAPTABILITY — Ardcor Standard Forming Machines feature "unit construction" for each stand. Thus production changes are easily and quickly made. With this feature, any length base can be furnished to accommodate additional units as required.
Ardcor Roll Forming machines embody the precision, accuracy and stability found only in the highest grade machine tools. In addition, Ardcor offers a completely engineered installation—cradle reels, roll forming machines, roller dies, flying cut-off fixtures, etc.—from one qualified source.
Likely as not your special shapes can be ideally handled by a standard Ardcor machine. Your inquiry is invited—without obligation.

Also Standard Machines up to 4½" Spindle Diameter

American ROLLER DIE CORPORATION

29540 Clayton • Wickliffe, Ohio

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-138

Change in company name from Vanton Pump Corp. to Vanton Pump & Equipment Corp. has been announced by J. J. Ashton, president. Reason for the alteration was laid to the addition of corrosion resistant plastic and hard rubber valves, pipe and fittings to the company's regular line, making the new name more appropriate.

At the same time, it was announced that the Vanton manufacturing plant has been moved from Long Island City to a new building on the premises of its affiliate company, The Cooper Alloy Foundry Co., Hillside, N. J. Executive and sales offices remain in the Empire State Bldg. in New York.

v v v

A company specializing in precision plating of precious metals has been established by Perry J. Sloane and Isidore Cross, under the name of Harper-Leader, Inc. Mr. Sloane has had extensive experience in the precious metal field, having been technical director of Donham & Craft, Inc., chief chemist at Benrus Watch Co. and chemist and plating foreman at Oakville Co. Div., Scovill Mfg. Co. Mr. Cross also has been actively engaged in the metal and organic finishing field both as supervisor of production and as a consultant. The company is located at 1046 S. Main St., Waterbury, Conn.

v v v

Acquisition of Solenoid Valve Div. of Wheaton Engineering Co., has been announced by Eclipse Fuel Engineering Co. The purchase includes production equipment, patents, engineering drawings, etc. Production of solenoid valves to be listed as Eclipse Series DO, was scheduled to begin in October.

v v v

According to recent announcement, Beverly D. Smith Co. has been appointed exclusive sales representative for the S-P Manufacturing Corp. The Smith firm, which will serve the Manhattan and Long Island area as well as the southern part of New York state, is located at 29 N. Dean St., Englewood, N.J.

v v v

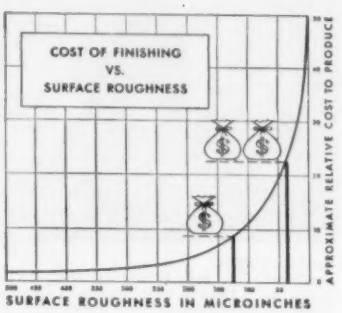
William E. Johnson has been named district representative for the Cleveland area by the Gisholt Machine Co. He has been associated with the firm since 1948.

v v v

The Henry Walke Co., with offices in Norfolk, Va., and in Charlotte, W. Va., has been appointed distributor for Carboloy Dept., General Electric Co.

Surface finish control can reduce *your* machining costs

PROPER surface finish control may well yield big savings in your plant by reducing production costs, increasing production rates, and improving product performance.



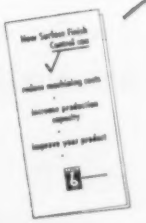
The chart shows how finishing affects the cost of machined parts. For example, if the surface finish is specified as 125 microinches and you are overfinishing to 32 microinches because of lack of proper gaging equipment, your finishing cost can be twice as much as necessary. To eliminate costly overfinishing, actual checks of machined surfaces should be made in the shop to be sure that specified values are met *but not exceeded.*

With surface finish control you can eliminate unnecessary operations and operate more efficiently. It helps you improve your products, since surface finish affects many factors in performance, such as break-in time, wear, heat transfer, lubrication, etc.

A new method of Surface Finish Control

THERE is now a simple method of measuring surface roughness on the production line so that the benefits of surface finish control can be realized. The Brush SURFINDICATOR* is a portable inspection tool . . . easy-to-use . . . accurate. This new instrument makes surface roughness measurement a practical shop operation.

*Trade Mark



Get the complete story—get your copy of this new booklet on Surface Finish Control. It offers you the key to reduced machining costs, more efficient use of equipment, and improved products. Write Brush Electronics Company, Dept. BB-11, 3405 Perkins Avenue, Cleveland 14, Ohio.

BRUSH ELECTRONICS COMPANY

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The Brush Development Co.
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INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZO-ELECTRIC MATERIALS • ACOUSTIC DEVICES
MAGNETIC RECORDING EQUIPMENT
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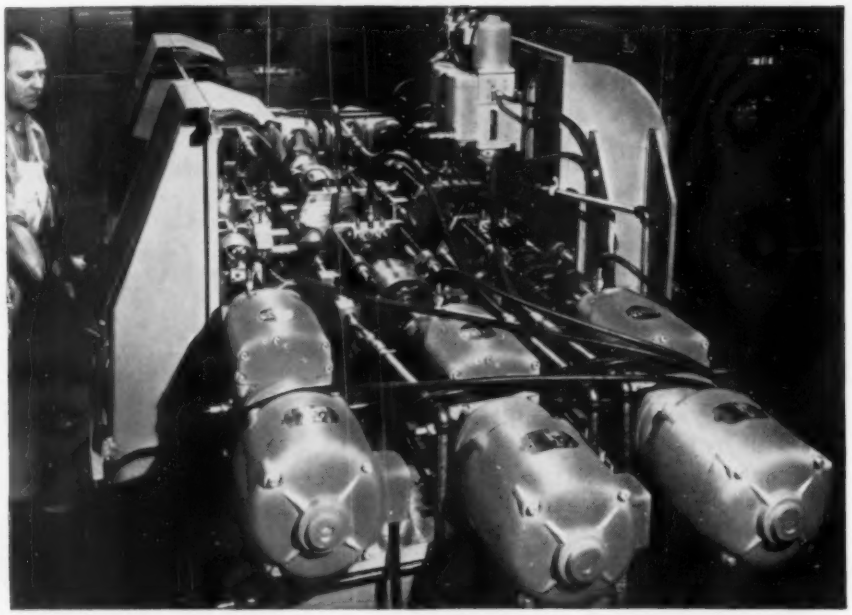


Machine Details
Dimensions: 10¾' long, 6½' wide, 7' high; weight about 16,000 lbs. 8 Delta drill units: 6 Model 19-400; 2 Model 19-150. 5 drill units equipped with multiple-spindle drill heads. Total HP—13.

Control Panel
Selector switches make possible any combination of 3 positions, 8 stations—a universal machine. Operator presses a starting button; sequence of operations is automatic; machine stops automatically when work is finished. 3000 feet of wiring between panel and machine.

From 25 minutes to 2 minutes

-that's the time saved by A.B.DICK CO. with 8 DELTA AIR-POWERED HYDRAULIC DRILL UNITS

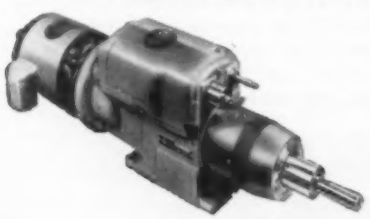
When conventional tools required 25 minutes to complete 9 holes in a spirit-duplicator cylinder, A. B. Dick engineers built their own special horizontal drilling machine, using 8 Delta air powered hydraulic drill units, and now do the job in less than two minutes.

Their new machine drills, spot faces and reams 9 holes in aluminum cylinders—needs but a single operator, has automatic remote control.

Operation of this 3-position, 8-station machine consists of loading and pressing the starting button. The Delta drill units operate in four banks, in automatically controlled sequence of drilling, spot facing, milling and reaming. When the cycle is completed, the finished piece returns to original position and the machine stops. It is universal—handles any piece up to 12" diameter and 24" length.

"This machine is so fast and so accurate," says Edward Brenn, design engineer, "that 3 or 4 days use per month is ample to keep up with production demand. The operator is free for other duties. We just didn't have the equipment to do this job economically—so we built the machine ourselves."

Three Delta air powered hydraulic drill unit models are now available to meet your specific requirements—1½", 4" or 6" stroke; No. 80 to 1" diameter drill. See your authorized Delta drill unit dealer—write for new catalog.



DELTA QUALITY MACHINE TOOLS
Another Product of **Rockwell**

DELTA QUALITY MAKES THE DIFFERENCE

Delta Drill Unit Division
Rockwell Manufacturing Company
620L N. Lexington Avenue,
Pittsburgh 8, Pa.

☐ Please send catalog AD-723.
☐ Send name of nearest authorized Delta drill unit dealer.

Name_____
Position_____
Company_____
Address_____
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High speed tool steels of regular analyses, to which have been added uniformly distributed sulphide lubricants in an unusual form, are now in production, Latrobe Steel Co. announces. Latrobe claims that longer tool life will result from use of their "X.L." steels, which are available in M-1, M-2 and M-10 types and in all of the sizes and shapes in which these types are normally furnished.

V V V

Third expansion to be achieved in the past three years has been announced by Palmer-Shile Co. The addition, known as Plant No. 4, involves 15,000 more square feet of manufacturing capacity, as well as new equipment to handle increase in production.

V V V

Ernest Nuber has been named sales manager for the Instrument Div. of The Bristol Co. Mr. Nuber, who has been manager of the application engineering department, will continue to maintain his headquarters at the company's main office at Waterbury, Conn.

V V V

Purchase from the Atlas Corp. the manufacturing and sales rights for Titeflex filters to the electroplating and metalworking fields has been made public by Wagner Brothers, Inc. The manufacturing already is being carried on at the Wagner Brothers Equipment Co.'s new plant at Wayne, Mich.

V V V

Heating Dept. headquarters of the Dravo Corp., Machinery Div. have been moved to the Chamber of Commerce Bldg., 411 Seventh Ave., Pittsburgh 19. The move has provided almost twice the floor area formerly available, and will permit expanding the department's facilities needed to serve commercial and industrial customers.

V V V

Morton Bearing Co. is now established in larger quarters at 815 Wildt St., Ann Arbor, Mich. Additional equipment thus permitted will allow the company considerable expansion.

V V V

Standard samples of the products of its members are being filed by The Felt Assn. in an exposition which is open to the public at the association's offices, 74 Trinity Place, New York. These samples cover specifications of The Felt Assn., U.S. Dept. of Commerce CS 185-53, SAE, ASTM, ASME and the military specifications of the Army, Navy and Air Corp.

Technical Digests

LARGE EXTRUSION PRESSES

Will Advance Design and Production of High Speed Aircraft

by G. E. Moni
Reynolds Metals Co., Phoenix, Ariz.

THE EASE OF PRODUCING complicated shapes and the added incentive of low tooling costs have made the extrusion process a principle method of manufacturing aluminum aircraft shapes. The aircraft industry, in the trend toward faster and larger airplanes, has made numerous requests of the aluminum-extrusion industry for shapes with cross-sectional areas and lengths beyond the capacity of existing extrusion facilities. A 5500-ton press, the largest in existence today, is capable of producing a shape that may be circumscribed by a 13-inch diameter circle with a maximum cross-sectional area of 22 sq in. weighing 600 lb.

The 8000-ton press shown in *Fig.* 1, which is being installed at the Phoenix, Arizona plant of Reynolds Metals Co., will develop its maximum effort through the use of two main cylinders with a capacity of 2700 tons each and the additive force of a 2700-ton piercer cylinder. It is possible, through the proper selection of these cylinders, to operate the press as a 2700-, 5400-, or 8100-ton machine. This press will be capable of extruding solid shapes from billets of aircraft-type alloys 17-inch diameter by 60 inches long, weighing 1500 lb, and tubular shapes from hollow billets 26-inch diameter by 60 inches long.

To meet the growing demand of the airframe manufacturers for stepped extrusion of the type shown in *Fig.* 2, the new presses are being equipped with multiple-gate locks that will provide a means of simplifying the extrusion process and increasing the productive rate for this type product.

Provisions are being made in spacing of the tie rods and front platen openings of the presses for the future use of rectangular containers. This appears to be the next required advancement in extrusion technology to utilize the press effort properly in producing the wide, relatively thin shapes that are being requested by the aircraft industry. The gain in the maximum width of a shape when using circular billets decreases rapidly as the press size is increased. The maximum-width shape that it is possible to produce increases linearly as the billet diameter increases, but the press effort required to produce that width increases in direct proportion to the increase in the billet cross-sectional area. If a 4000-ton press with a maximum circumscribing circle of 12 inches is used as a base, the ratio of the increase in press size increases more rapidly than the ratio of the maximum-width shape increases, *Fig.* 3.

Rectangular containers provide a method of obtaining a greater section width from a given size press by using a billet of greater width with less cross-sectional area and the resultant higher unit extrusion pressure.

These presses, like existing presses, initially are designed to employ the direct-extrusion process. This process has enjoyed extensive use because it offers lower tooling costs, larger extruded shapes, and superior extruded surface that can be obtained with indirect extrusion.

Press size and capacity will be the

Fig. 2. Section of stepped extrusion for aircraft spar caps.

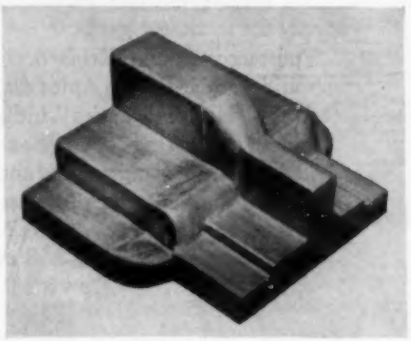


Fig. 1. New 8000-ton extrusion press.

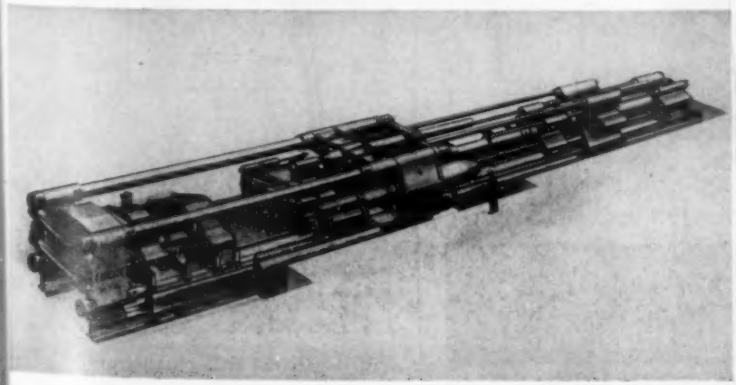
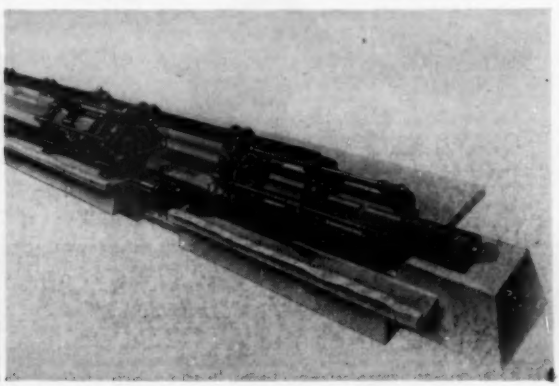


Fig. 6. Stretch leveler of 3,000,000-lb capacity.



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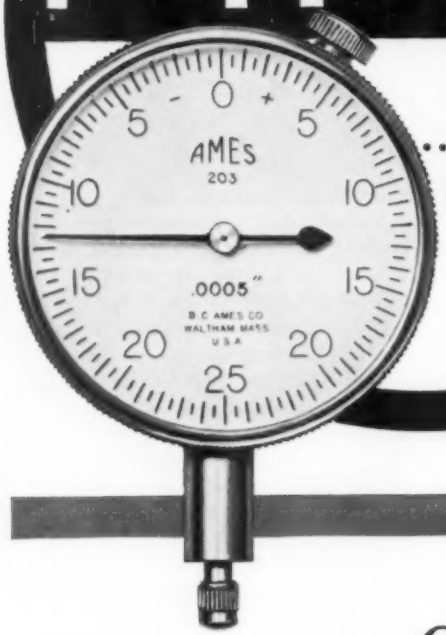

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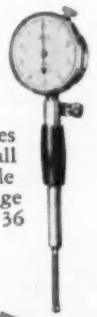

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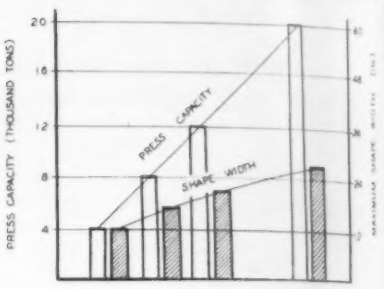
Technical Digests . . .

limiting factor in the size of shapes that may be produced. All auxiliary equipment will be capable of processing the full range of sizes producible by the

Fig. 3. Large press capacities are required for small gains in shape widths.



presses. Billet-producing facilities consisting of remelt furnaces, preheat ovens, direct-chill casting machines, saws, internal scalping machines and induction reheat furnaces are planned.

The direct-chill casting machine, *Fig.* 4, is of special design capable of producing cast ingots 20 ft long in the various billet diameters required. The machine is a rigid, self-contained, mechanically driven unit with a hydraulic counterbalancing system to insure controlled, uniform, presetdrop rates.

Extrusion-finishing facilities consisting of heat-treating, stretching, straightening, contouring, aging and annealing equipment are being provided to process completely all types of extruded products in finished lengths to 100 ft. This equipment, like the presses, is being designed for maximum flexibility to provide the means of keeping abreast of technological advancements.

The heat-treat furnace will be the

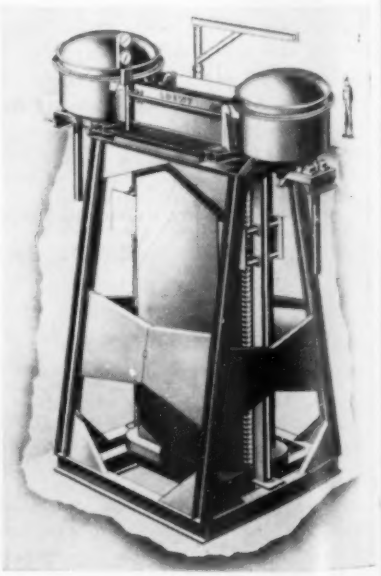


Fig. 4. Direct chill-casting unit.

vertical type, shown in *Fig.* 5 with a capacity of 50,000 lb and able to heat-treat shapes 115 ft long. To obtain structural stability and the high air velocities required to maintain uniform metal temperatures over the full length of the load of plus or minus 5 F, a twin-barrel design is being utilized.

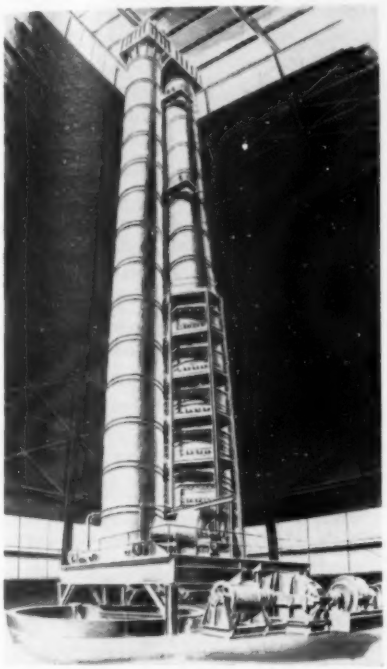


Fig. 5. Vertical heat-treated furnace.

The rate at which quenching of aluminum shapes is accomplished has a distinct effect on the physical and corrosive properties of the metal. To provide a fast quench in the horizontal furnace, the shapes must be presented to the quenching media in a horizontal position. This causes severe distortion necessitating extensive supplementary operations for correction. The distortion can be minimized at the sacrifice of physical and corrosive properties by resorting to a heavy-spray quench.

The vertical-type furnace, with its vertical quench and lack of need of product supports, presents the only solution available to date, flexible enough to process the full range of products possible to produce.

The stretcher, of the type shown in *Fig.* 6, will be a 3,000,000-lb capacity machine with 3,500,000 in-lb rotating head and tailstocks capable of stretching and untwisting aircraft-type alloy shapes with a cross-sectiontal area of 60 sq in. 115 ft long.

Extension of present uses and development of new applications of extrusions for the capacities of the large presses and their auxiliary equipment, will present wide fields of exploration for the airframe designer.

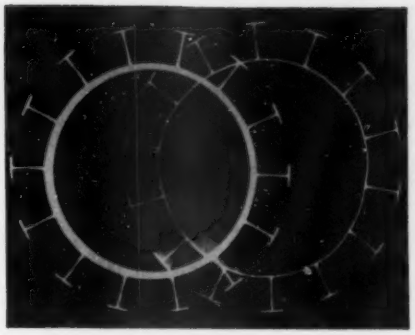


Fig. 7. Extreme ends of extruded tube showing range of taper obtainable.

Solid shapes, those producible from solid billets, may be produced from the aircraft-type alloys in an unlimited number of configurations that can be circumscribed in circle sizes to 21-in. diameter with a maximum cross-sectional area of 50 sq. inches. These shapes may be processed in finished lengths of 100 ft depending on the cross-sectional area, maximum-size billet and process scrap involved.

Stepped extrusions, a special solid extrusion, will be producible in the same size ranges that apply to the solid extrusions except for more stringent limitations on configuration and minimum thickness.

Extruded tubing and symmetrical shapes that may be produced over a mandrel will be available in sizes to a maximum 27-inch OD circle.

Integral-stiffened sheet will be available in tubular form in a range of sizes that will, when flattened, develop sheets from 30 to 80 inches wide. This type of shape may be produced with a tapered skin (tube) varying from the minimum thickness of the shape to four times that thickness as shown in *Fig.* 7. This shaping process was developed at the instigation of the airframe manufacturers and, now with the successful experimental flattening of the tubes to aerodynamic smoothness, promises to be a preferred airframe extrusion.

From a paper presented at the 1953 semi-annual ASME meeting, Los Angeles, Calif.

▼ ▼ ▼

Shot Peening Gears

by John C. Straub

Chief Research Engineer
Am. Wheelabrator & Equipt. Corp.

Shot peening is a process which might well be considered in the design of any machine part which is required to carry high loads with a minimum size or weight of the over-all unit.

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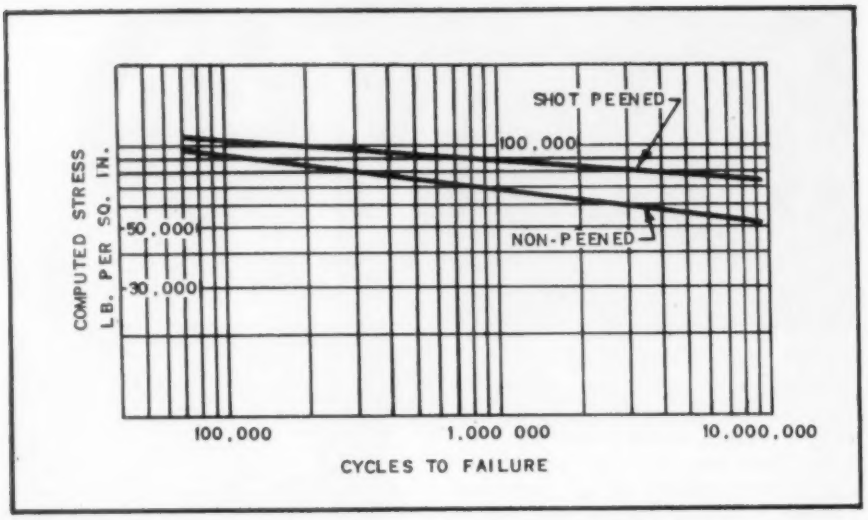

Fatigue Chart of carburized automotive type spur and helical gears, shot peened and non-peened.

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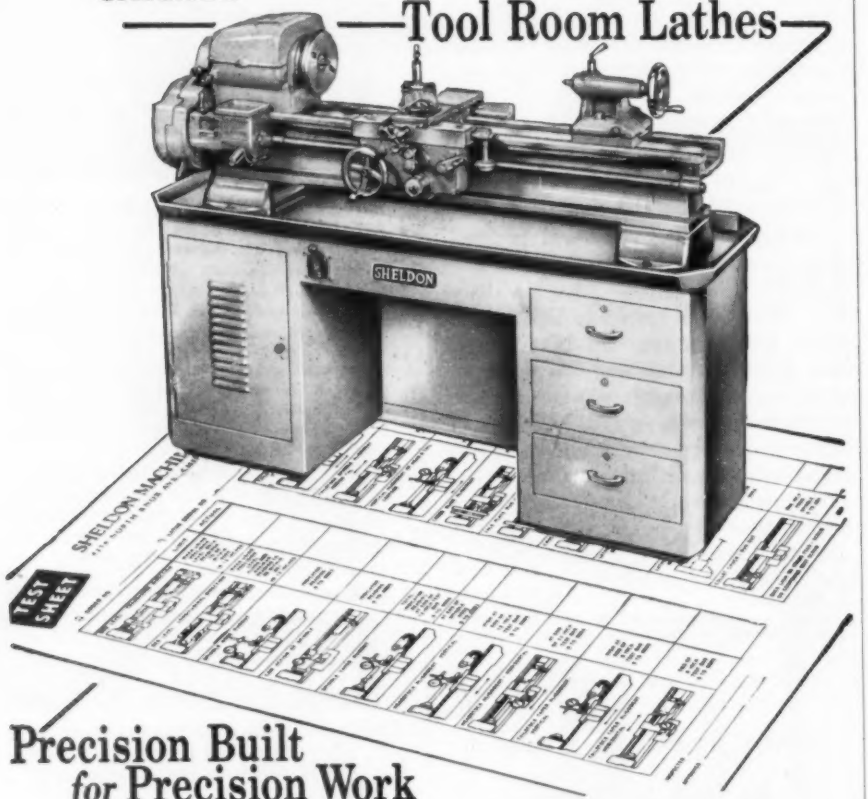

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but also in design, to increase load carrying capacity per pound of gears as well as other machine parts as indicated in the chart.

Naturally, any pair of gears designed for high-load carrying capacity involves good manufacturing practice with respect to the geometry of the gears, material, manufacture and metallurgy. As in any other machine part, the improvement by virtue of shot peening will start from the level of quality of the gears without the benefit of shot peening.

A few years ago, shot peening of a particular machine part may have been looked upon as evidence that the part in question had at some time given trouble in service by reason of fatigue failures. Today shot peening is being considered more and more as a means of increasing the allowable fatigue strength in the design of machine parts. The fact that a part is being peened in production does not necessarily imply that fatigue failures have been experienced on that part in the field.

From a paper presented at the 1953 annual meeting of the American Gear Manufacturers Association.

▼ ▼ ▼

New Assembly Techniques

W. L. McCarthy, Forum Leader

General Motors Corp.

Developments were discussed under four general topics: 1. Problems involved in high volume production of thousands of pieces per day. 2. Problems involved in lower volume production of larger parts. 3. Group incentive wage payment as compared to a flat rate plan. 4. General problems.

High Volume Production Problems

Before any new machine is built it is essential that the engineering department attempt to determine the future needs of the customers. If any design changes are contemplated provisions for these changes should be built into the machine in order to avoid costly changes at a later date. In building these machines standardization of the bases and certain other parts has been made in order to provide as much flexibility as possible for future changes.

The work speed and the rate of production on a new special purpose machine are determined by a study of the schedules which might be met. The work to be done on the machine is

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broken down into the task to be assigned each operator and a comparison of this breakdown is made with other similar jobs being done on the same type of equipment. From this comparative study the cycle time is determined.

In the special machine building department one or two men have the assignment of training new people. These men report to the foreman in charge of this department. Their responsibility is to take the operators assigned to the new machine, acquaint them with their new jobs and assist them in every manner in gradually increasing their productivity on the machine until it is operating at its normal cycle time.

The machine is operated at its normal index time throughout the entire training period. At first the operator will miss some stations on the machine as it indexes, but as he becomes more familiar with the work he is able to keep the machine loaded.

When the machine is moved to the production line, little difficulty is experienced in most cases, since the operator and the tool people have been trained during the past several weeks as the machine is being "bugged out." Top supervision in the plant must accept a new machine and the interest must come from them. They must follow through on the problem of making better and more uniform parts. It is essential that there be no letdown in the feeling of pride in a new machine on the part of the operator.

Low Volume Production Problems

When a single assembly line is used for a wide variety of models, a number of determining factors must be considered for efficient production.

One manufacturer, for example, schedules models on his assembly line which vary as much as forty to fifty percent in the man hours required. These models are spaced on the line in accordance with the amount of work to be done on them. The number of men assigned to this line is an average for the jobs being built on the line for that particular day. To maintain approximately the same number of men on the line, a daily schedule of fast and slow assemblies is planned five days in advance. In order to operate this variety of work efficiently the men on the line help one another on fast and slow jobs. At times assemblies are built off the line and at times on the line.

If good assembly efficiency is to be attained, thorough scheduling and planning not only of the assembly line but

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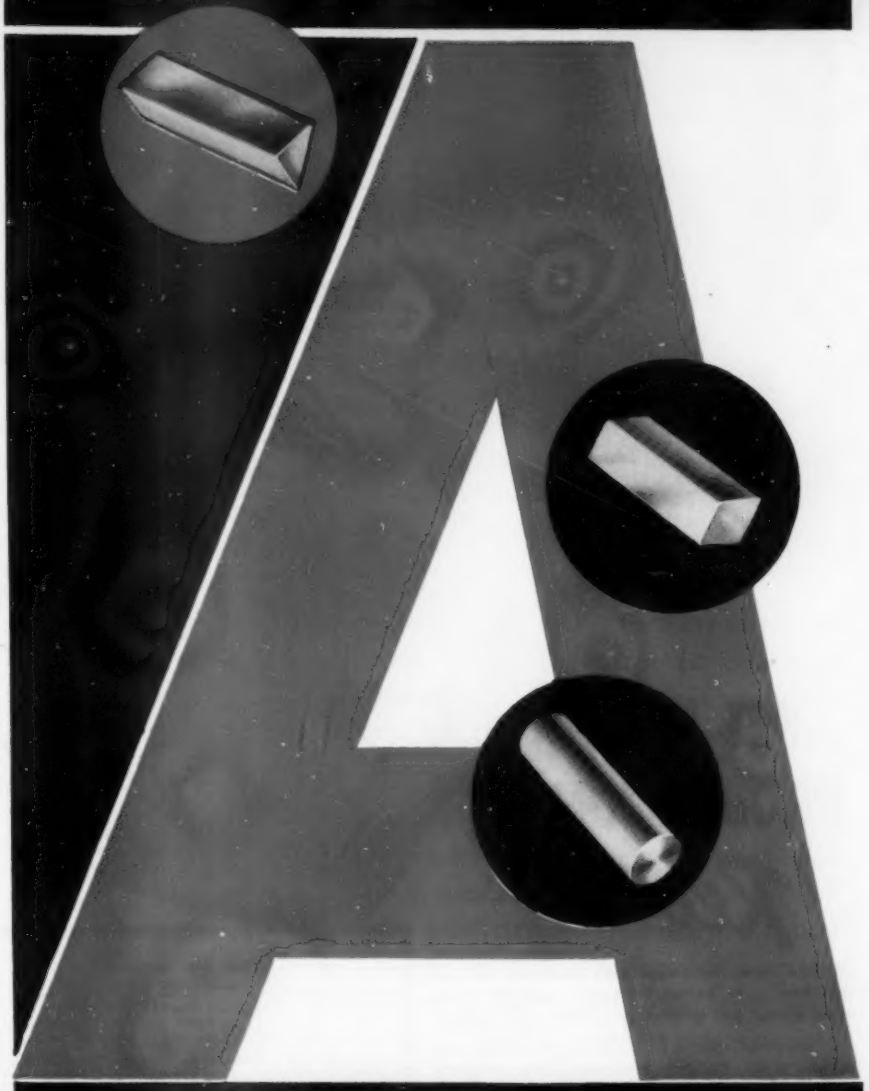

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also the component parts departments must be done. In many cases jobs are scheduled from customer orders. Proper lead time for the parts departments must be set up and assemblies scheduled in accordance with this. In this type of manufacture the amount of money tied up in inventory is often a serious problem.

So each man on the assembly line knows what he is to do. He is assigned certain jobs during a constant schedule. The line is rebalanced whenever schedules change and work reassignments are made. Each job has a standard set on it. Supervision must know these rates and properly assign work to the men. Extra men should not be kept on the line because of lowered efficiency.

One manufacturer feels that quality control has helped his scheduling greatly by reducing rejections and giving a better flow of parts. He feels that quality control is a means of getting pride of workmanship back in the job.

Production Payment Plans

Piecework has both advantages and disadvantages compared to day work. More supervision is required to maintain a high level of productivity when people are paid on day work and carelessness may be more prevalent under this plan. In the case of piecework the operators are more likely to police themselves and maintain their rate of production. However, a great many difficulties arise when new jobs are put into production and when excessive troubles occur on old jobs.

In most cases the method of doing a new job is laid out and an estimate is made before the job is started. In some assembly operations there is often a trial and error period before the proper method is established.

The base rate is paid on a new job while it is being "bugged out." After a short time if it is apparent that the rate cannot be made, it is restudied and a proper rate is set. In some plants, when the operating conditions are beyond the operator's control, an additional allowance is made.

In one plant using the group incentive plan, each assembly unit has a dollar value. At the end of the day the total dollar value of all the assemblies produced is added up and divided by the man hours spent in order to determine the premium earned by each man on the group. This premium plus his fixed rate gives his total earnings.

In plants using the incentive plan the operators usually leave off at a certain rate of production so that their take-home pay is fairly constant. If they work too fast they sacrifice quality in

order to get production which is not desirable from the company standpoint. Early quitting has not been a serious problem in plants using the incentive plan.

In nonincentive plants the supervision insists on a fair day's work. The operator must stay at his work place and continue his job for the entire shift even if he has made his standard production for the day sometime prior to the close of the shift. He may clean up his work or do other work until quitting time but he must do a fair day's work for a fair day's pay. Early quitting has not been a serious problem in the plants using the flat-rate method of pay.

Where tooling changes or better methods have been shown to the operators, there has been little resistance on the part of the operator even though the rate of production required is higher. It is necessary to sell the operator that he can produce a greater quantity of pieces with the new method but that no increase in effort is required because of improvements in the previous method.

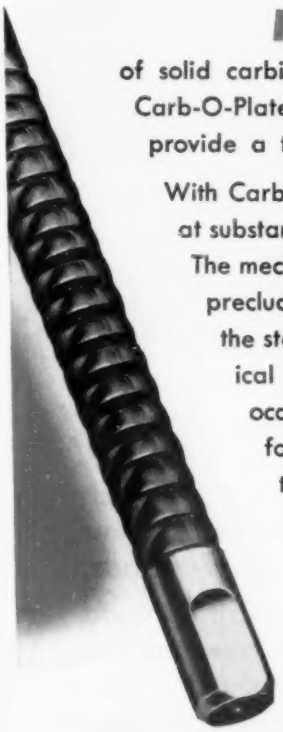
Either method of payment can be used successfully. In either case well-trained supervision and good employee relations are vitally necessary in order to maintain efficient production.

General Problems

Apparently cooperation between production supervision and product engineers is greater in some plants than in others. One plant reported that a series of regular meetings is held between the production supervision, tooling department and engineering department when a new model is to be built in order to get the best and most economical design. This mutual cooperation must be developed over several years of operation. Changes that are requested by the shop are thoroughly checked by the engineer through test samples to be sure that quality is maintained.

Design committees are used extensively in various plants in order to standardize and to eliminate costly operations while maintaining the basic design needed in the product. One plant assigns their product engineers to spend ten percent of their time on the assembly line in order to familiarize themselves with shop problems. Another plant brings in foremen and workmen to meet with the engineers to discuss new designs in order that all opinions may be considered.

Much effort is being spent to make assembly operations automatic, but assembly operations vary to a much greater extent and sometimes do not lend themselves to automatic equipment



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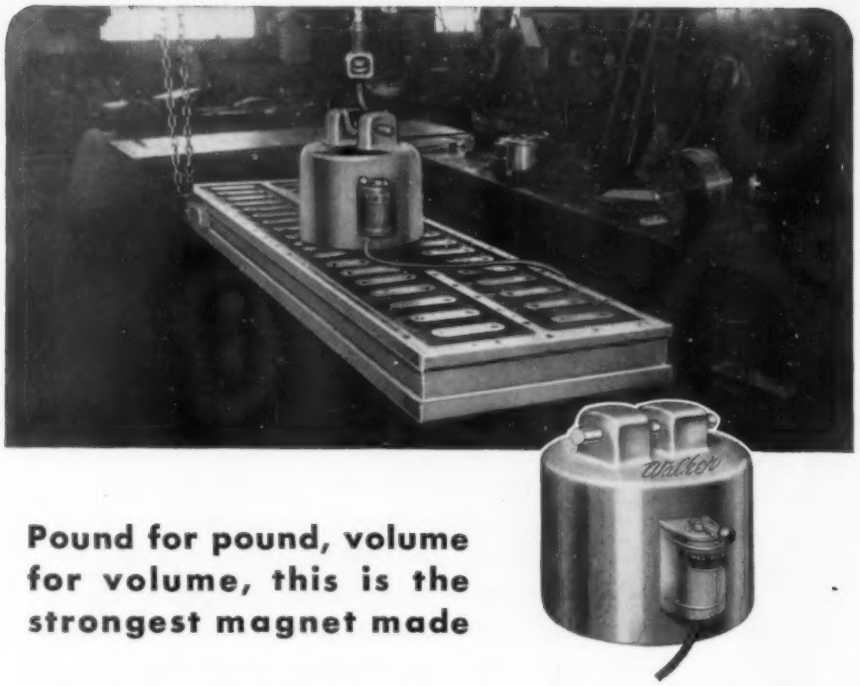
as readily as machining operations. Work is being done on transfer type of equipment to eliminate unnecessary handling of assemblies.

To reduce absenteeism among women, some plants determine an average absenteeism rate and carry extra people for replacements from day to day. A better method of reporting illness and a thorough discussion of poor performance with the operator in many cases has shown good results. In most plants during the present period of high employment the insurance claims of women operators have gone up. In some plants the practice of having the foremen call on sick people and maintain a closer personal contact with them has been effective. Many plants are using an investigator to go to the homes of people who are chronic absentees to determine the validity of the reasons they give for being absent from work. This problem has been a difficult one.

From the 1953 SAE National Production Meeting, Cleveland, Ohio

Walker Does It Again-



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Original Designers and Builders of Magnetic Chucks

O. S. WALKER CO. Inc.

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Machining Aircraft Parts

K. W. Stalker, Panel Leader

General Electric Corp.

Machine tools of a special nature being built for the production of aircraft components will make available ultra high cutting speeds and feeds. Machines with speeds up to 10,000 feet per minute and feed rates of 375 inches per minute are being readied. Machine tools are becoming available for tracing at 100 inches per minute. Heavy machine tools as well as high speed machine tools are being made. These are designed to handle large components for the aircraft industry and can also be setup to machine die sets.

Provisions to confine cutting fluids to the right place and deliver them at the right time on these ultra-high-speed machines include fog type coolants which combine compressed air with extremely small volumes of cutting fluid. A curtain of cutting fluid is also being used. This not only cools but carries the chips to a central location where chips and fluid are separated. The fluid is returned to the sump and the chips are removed by conveyors. In some cases the coolant only washes the chips to the end of the machine where they may be picked up by conveyors. In some cases the chips and fluids from several machines are processed at one location. Vacuum chip removal has not been found too satisfactory.

In milling stainless steel, carbide cutters are widely used. Selection of cutting fluids for application to this type of material is of primary importance. Insert type cutters with carbide tips are used to the greatest extent and are giving the best results. The grades of carbide in more common use are straight tungsten carbide composition. Some manufacturers are using minus 6 degrees axial rake and minus 6 degrees radial rake. Others, 0 degrees axial combined with 6 degrees radial rake.

It has been found that considerable chipping may occur with high positive rake, and wear is the major problem with high negative rake. Chips welding to the cutting edges have proved to be a major problem. If these chips are knocked off in cutting, the carbide tips tend to chip. Chip welding is not so bad in climb cutting as in conventional cutting due to the fact that as the cutter leaves the work in climb cutting, the chip thickness approaches zero.

If chip loads in the neighborhood of 0.001 to 0.002 inches are used, there may be some tendency toward excessive wear since a major portion of the cutting is being done in a work hardened area.

Interrupted cuts on lathes, boring mills and similar pieces of equipment often have given difficulty when carbide tools are used, since chipping occurs. In these cases, cast alloy tools operating in the neighborhood of 140 feet a minute with a feed of 0.008 inches have proved satisfactory with water type cutting fluids.

Considerable application of supersonic and electric arc cutting is being made to the hard and brittle materials such as ceramics and carbides. When machining the high temperature alloys, which tend to be ductile, these methods prove to be relatively slow.

Carbon dioxide as a cutting fluid has not realized expectations since sufficient volume of material was not available. Furthermore, the cost of CO_2 may be prohibitive. It may be that CO_2 has possibilities in grinding if only the heat involved is considered.

For interrupted cuts on jet engine alloys negative side rake combined with positive back rage is beneficial since the major problem is impact, but chip welding is also encountered. The negative side rake adds noticeably to impact resistance while the positive back rake decreases cutting pressure.

In milling of air frames of 75 ST aluminum the warpage involved gives considerable difficulty, nevertheless, it has been found that if parts are cast, stress relief annealed, rough machined, annealed, finish machined and then given a final anneal to make sure that no stress remains, distortion of finished parts may be minimized. Tolerances on cast parts have been held to .0005 and even in some cases to .0001. The three anneals mentioned have proven essential to obtain these tolerances on cast parts.

Some tests to date indicate carbon content has a considerable effect on the machinability of titanium alloys. In one group of tests carbon content varied from 0.01 to 0.07 percent. In this range it was found necessary to decrease the cutting speed by one-half.

The following tabulation indicates the approximate results of some tests performed to date.

Ti 150A (C .01%)	200 ft./min.
MST (3% alum., 5% chr., .07 C)	75-100 ft./min.
RC 130B (Remcru)	150 ft./min.

In a series of tests on titanium alloys having a carbon range from less than 0.1 percent to 0.7 percent, it was found that those materials with less than 0.3 percent tapped better. For example, in an alloy with 0.40 percent carbon the tapping speed was 15 to 20 ft./min. When tapping 0.01 percent carbon ma-

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Mounted on a Universal Grinder, the Dumore operates at a spindle speed of 40,000 rpm. Work speed is 300 rpm.

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PRODUCING drill chucks requires a difficult jaw grinding operation. Smooth finish and correct back taper are necessary. And each day, the grinder must withstand millions of hammer-like blows transmitted to the grinding wheel and spindle bearings.

Since 1927, this chuck manufacturer has used DUMORE precision grinders. Here is his report:

"Our Dumore No. 5 units operate 100 hrs. weekly to internal grind open jaws for our ⅛" to 1" plain bearing key type chucks. Material is 60 Rockwell C hardness alloy steel. We remove .005".

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If you're seeking to improve internal grinding operations, investigate the advantages Dumore grinders provide. Get details from your industrial distributor or write direct:

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Technical Digests . . .

terial, tapping was increased three times.

Some of the problems encountered in machining titanium alloy parts can be traced to the fact that the metal is susceptible to cracking.

Improvement in machinability of titanium alloys by producers does not appear to be such that appreciable changes may be made. The material as manufactured is setup to meet engineering design requirements with machinability secondary.

From a panel discussion held during the production forum of the 1953 SAE National Aeronautic Meeting.

▼ ▼ ▼

Aluminum Finishes that Resist Wear and Erosion

by R. V. Vanden Berg
Alcoa Process Development Laboratories,
Aluminum Co. of America

When aluminum is the anode in certain electrolytes, a dense oxide coating may be formed on the surface. The characteristics of this coating may be changed by variation in operating technique; however, in every case the coating is integrally bonded to the surface.

Hard chromium plating based upon the zinc immersion process is being used to increase the surface hardness and wear resistance of alumium alloys, for some lightweight engine applications. Recent developments indicate that plating with a new type of nickel-phosphorous alloy shows promise for applications requiring wear resistance. This system is particularly advantageous whenever parts with deep recesses require a wear resistant surface.

Other developments also indicate that vitreous enamel coatings on aluminum alloys may be the solution to many problems involving resistance to wear and erosion for certain specialized applications.

From a paper presented before 1953 SAE Annual Meeting.

▼ ▼ ▼

Nondestructive Testing

by K. A. Skie, Magnaflux Corp. Chicago, Ill.

The final cost of a machine part to the purchaser depends upon the price per pound of the castings, the cost of machining and assembling, and the service life of the part itself, according to the American Malleable Iron handbook.

Foundry users report that the use of nondestructive testing methods directly or indirectly influence all three of these factors. The use of oil and whiting, ringing or percussion testing are nondestructive tests according to the broad definition because usefulness of the part is in no way impaired after such a test. Some of the later tests, such as X-ray, Gamma-ray, magnetic particle, ultrasonic or penetrant tests might be regarded as improvements, but only if used intelligently as tools to aid the inspector. They really tend to reflect a change in attitude regarding the inspection department in general in the foundry. The foundry inspector has increased in stature because of his tremendous potential in cost and scrap reduction. He once was regarded as overhead. He is now a roving consultant. He may possibly increase the output of the molding department by 5 to 10 percent with no increase in personnel, when adequately equipped. He is interested in getting at the source of the trouble and in preventing recurrence. To perform this function he needs all modern tools at his disposal.

Now, which of these methods should be applied in a malleable foundry? If we wish to study the gating

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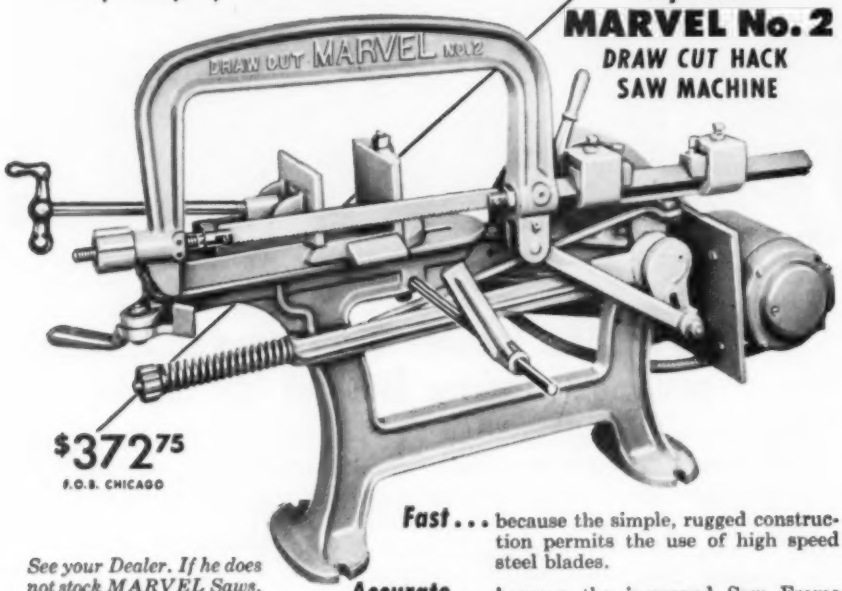

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KELLER Air Tools

Technical Digests . . .

system of an experimental casting, X-ray or Gamma-ray can be invaluable. Many of you are using radiography at this point.

Magnetic particle testing is frequently used in conjunction with X-ray. The former to detect surface flaws for which it is best suited, and

Particles clinging to the casting indicate sub-surface defects.

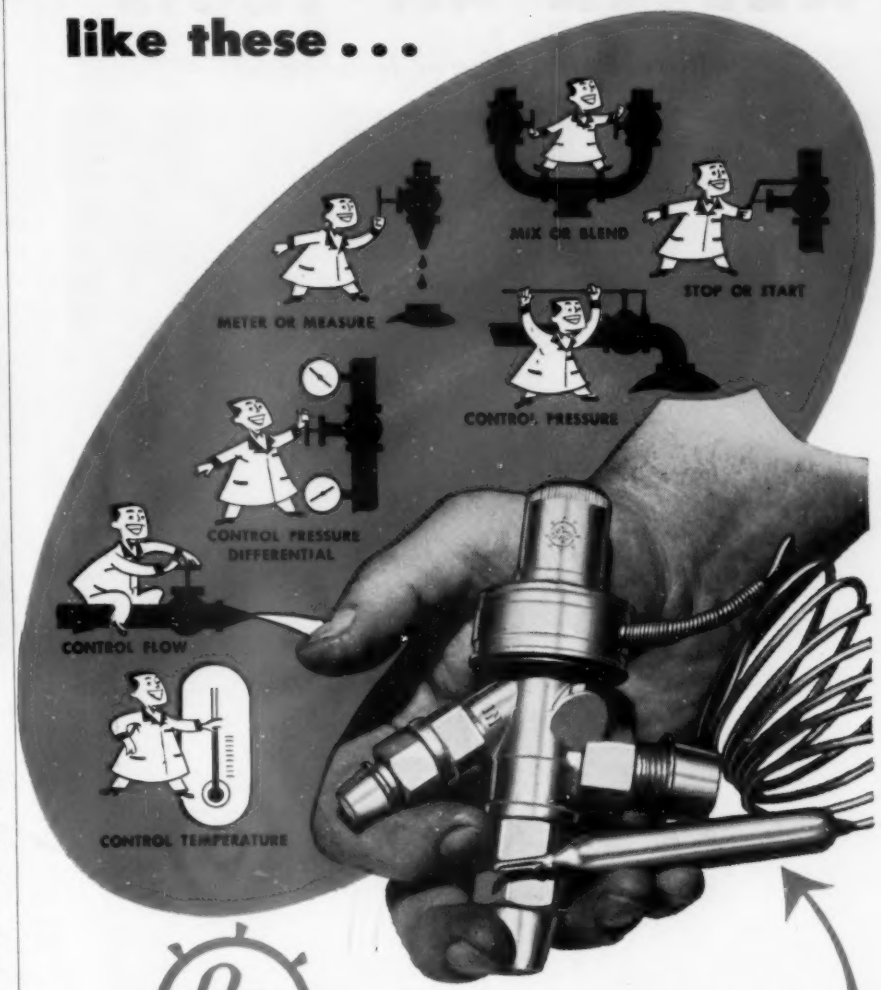
the latter subsurface condition. It may be an advantage that the indication of relevant defects are shown at the exact location where the defects occur.

In certain instances, magnetic particle techniques may be used as a production inspection means to detect subsurface blow holes or shrinkage in confined areas.

To date, ultrasonic techniques have not been extensively applied in the malleable foundry, and it is quite possible that within the next five years, rapid advances will be made in this field that will make these methods applicable to foundries.

These tools, then, must be used to aid in making acceptable castings not to reject castings, in order that their use will show a profit. The cost per pound of the casting may be greatly influenced through the use of nondestructive testing methods for detection of potential scrap at its source. The cost of machining and further processing may be influenced greatly through intelligent use of nondestructive testing and customer satisfaction assured. Service life is dependent more upon design and production defects than upon any other factors. Mr. Almen of General Motors says: "Fully 90 percent of all fatigue fail-

If you have flow-control problems like these . . .



An A-P valve like this may be your answer

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FACTS IN BRIEF ABOUT KELLER NUT SETTERS

Weigh less

Consume less air

Interchangeable parts

Reduce operator fatigue

Torque controlled from 20 to 70 ft/lb

Running down and tightening the nuts which attach hinge arms to an automobile hood requires a nut setter with extra power. The Keller 16-C Nut Setter has an especially powerful motor capable of handling machine screw nuts up to 5/8". . . yet for all its power it is light in weight and easy to handle.

In the illustration above, the 16-C Nut Setter is provided with a 90° attachment to deliver power at a more convenient angle.

Keller Air Tools deliver more power per pound — speed production and reduce costs. We would like to tell you more about them.

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ures occurring during laboratory and road tests are traceable to design and production defects and only the remaining 10 percent, primarily the responsibility of the metallurgists has defects in material, material specification or heat treatment." Scattered porosity and voids are not nearly so detrimental as minor cracks and tears.

From an address given at the 1953 Market Development Conference of the Malleable Founders Society at the Illinois Institute of Technology.

▼ ▼ ▼

Material Handling

H. O. Horning, Forum Leader
Chrysler Corp.

The newest developments and ideas in material-handling fields are:

1. Specialized equipment, with standard or commercial attachments.
2. Palletizing to become available commercially.
3. The common tote pan given recognition through improved design to standardize and strengthen.
4. Overhead conveyors being lightened and expanding in industry to use as stock facility.
5. Increased use of collapsible containers.

The five most important material-handling facilities in industry today are: conveyors, utilizing either chain, cable or belt; fork truck, used as lift, draw or transport; pallets, in wood, metal, paper, or mesh; tote pans, solid, mesh, or wire; collapsible containers, wire type to take advantage of returnable knock-down feature; open tote pans, wire or mesh result in good housekeeping; good pallet design results in fewer fork trucks required; radio equipped fork trucks result in full loads both ways; trailers should be designed to handle full pallet loads; qualified replacement for absenteeism reduces abuse to truck; check fork truck at end of each shift for preventive maintenance; in many cases proper overhead conveyors can replace expensive fork trucks.

Material handling engineering has become an excellent field for upgrading, usually at 25 percent turnover into better jobs. It fits into a staff position in industrial engineering division, master mechanic division or under works manager. In some cases under production control, but in some automotive companies the work and appropriations are passed on by top management vice

the new

president or president.

Properly applied material-handling engineering can standardize containers, equipment and material-handling methods; can and does influence production, traffic and inventory methods. It provides a collective and coordinative agency for packaging, design, sales merchandising; keeps current with material-handling methods and equipment; utilizes vendors know-how to company's advantage; carries out projects in line with company's objectives; correlates consumers' problems with proper shipment and containers. It enables the company to improve competitive position through cost reduction. It saves stocking and storage space; reduces stock deterioration.

From a paper presented at the 1953 SAE Production Forum, Cleveland, Ohio.

▼ ▼ ▼

Statistic Aid Testing

by V. V. Kendall,

National Tube Div., U. S. Steel Corp.,

A way has been found to make the laws of chance and mathematical statistics excellent tools for solving current problems in the study of steel corrosion.

A procedure was developed by which conditions in individual corrosion testing cabinets are made uniform, so that for the first time comparisons can be made between results obtained in different steel laboratories. The procedure consists in making studies of a standard steel or steel coating, including this standard in all other cabinets and analyzing the various results by the use of mathematical statistics.

The laws of chance govern the location of the standard specimens in all testing cabinets. A squirrel cage, or drum, similar to that used in lottery drawing, is filled with little spheres numbered from 1 to 500, and these balls are used in the preparation of a list of random numbers. Five hundred casts with a pair of dice further assist in selecting an arrangement pattern for specimens in the testing cabinets.

This system represents parts of the results of the work of the American Iron and Steel Institute Committee on Protective Coatings. This committee is making an extensive investigation of corrosion testing cabinets which are used to evaluate oils and other coatings used to protect steel in transit and in storage.

From a paper presented at the Sixty-first General Meeting of American Iron and Steel Institute in New York.

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universal Burr-Master* by MODERN

. . . the high-speed answer to your gear burring problems!

A TRULY UNIVERSAL GEAR BURRING AND CHAMFERING MACHINE with these 8 OUTSTANDING FEATURES

*Patents Pending

1. Burrs and chamfers both spur and helical gears.
2. Burrs and chamfers both straight and involute form external splines.
3. Burrs and chamfers both sides and root of tooth at more than five teeth per second.
4. Two models for all popular pitch gears from ⅝ to 6½-inches pitch diameter and 3 to 9½-inches pitch diameter. Two-station models also available for added versatility.
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Good Reading

METAL MACHINING *by Lawrence E. Doyle. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York, N. Y. Price $10.00. 511 pp.*

A thorough and comprehensive introduction to metal machining, process planning, equipment, methods and techniques is provided by this book. Major machine tools and operations are taken up in logical sequence, beginning with a concise and rounded presentation of dimensions, tolerances and gages. Pertinent applications of process planning are introduced in each of the succeeding sections on shaping, planing, drilling, milling, boring, broaching, grinding, surface finishing, and gear making.

Each section has been kept simple enough to be understood regardless of extent of experience in the field.

TECHNIQUES OF PLANT MAINTENANCE AND ENGINEERING, *1953 Published by Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y. Price $6.00 288 pp.*

This book covers proceedings of the technical sessions at the Fourth Plant Maintenance Show, Cleveland, 1953. The discussion yields data about principles and techniques to assist in maintaining the industrial plant at top operating efficiency.

Reported in this volume are formal addresses, sectional meetings and round table discussions which cover all phases of plant maintenance.

APPLIED ELECTRICITY, *by H. Cotton. Published by The Industrial Press, 148 Lafayette St., New York 13, N. Y. Price $4.50. 482 pp.*

A sound basis is presented in this book for understanding the theory of magnetism, and the theoretical and practical aspects of all types of electrical equipment. Clear and easily scanned reference is provided for electrical and mechanical engineers and students.

Included is a comprehensive account of the meter-kilogram-second (M.K.S.) system of units. There are also new sections on the triode tube, the photocell, and a chapter on cycle diagrams. Problems and answers taken from each chapter are supplied in the back section.

TRADE LITERATURE For Free Booklets and Catalogs

MATHEMATICAL PHYSICS *by Donald H. Menzel. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York, N.Y. Price $11.35. 412 pp.*

This volume, although primarily concerned with classical physics, specially emphasizes those topics closely related to modern phases, either in technique or subject matter. Electron theory and general relativity, seldom presented in other works, appear here in considerable detail.

The reader is expected to possess a good working knowledge of differential and integral calculus. All other phases of mathematics are used during the presentation of the various subjects.

The following topics are discussed in this book: physical dimensions and fundamental units, mechanics and dynamics, waves and vibrations, classical electromagnetic theory, and relativity.

GENERAL GUIDE IN COMPILING A SYLLABUS OF TRAINING FOR APPRENTICE TOOL MAKERS, *Published by The Gage and Tool Makers' Association, Standbrook House, Old Bond St., London, W.1 England. Price 70c. 19 pp.*

This booklet presents a British syllabus for setting up apprentice training for gage and toolmakers.

Practical and technical aspects are outlined in detail. The appendix contains mechanical drawings applicable to the various tool room machines.

WELDESIGN, *Published by The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio. Price $10 in the United States, $12 elsewhere.*

A complete self-study kit in the weldesign system for the application of arc welding and the inherent qualities of steel and the properties of weld metal.

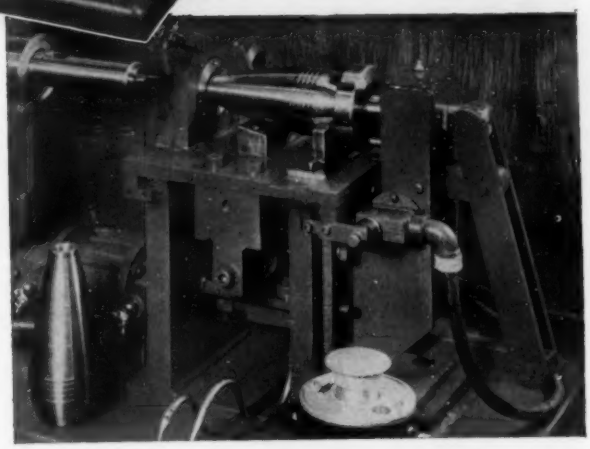
The kit consists of (1) a manual outlining factual welding design data, charts, nomographs, tables, cost calculator, process selection guides and time charts; (2) a guide book to use with the manual for self-study giving instruction in the reading of charts, calculators and other data; (3) a copy of the "Procedure Handbook of Arc Welding Design and Practice" for reference and supplementary reading; (4) cost calculator slide rule; (5) moment of inertia rule, and (6) a set of weld standards for use in applying the weldesign system printed on onion skin to permit duplication. Weldesign, originated and published by The Lincoln Electric Co. of Cleveland, Ohio.

450 pcs. per hour!

Taps .800-16 in 81M Smoke Shell—7/8" STROKE

Another Cleveland Design to Speed Production!

MODEL E-2 HORIZONTAL



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Day after day this Cleveland machine has been turning out an average of 450 pieces per hour! Two cradles operate on a 2 position, air-operated shuttle. Operator loads shell in open cradle and pushes palm start switch. At end of tap cycle in progress the new part is brought into tapping position and the tapped part brought out to one side for unloading.

Cleveland engineers have designed machines to meet the special requirements of scores of plants throughout the country. Because of their know-how—because of the precision tapping achieved at high speeds by Cleveland's famous lead screw feed and because several operations can be combined in one machine—you can be sure of getting more perfect pieces per hour with a Cleveland machine designed for *you.*

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TRADE LITERATURE

For Free Booklets and Catalogs—Convenient Request Card on Page 131

Plating Anodes

Eight-page illustrated catalog 141 provides information on copper, lead, zinc, tin, cadmium and brass plating anodes, giving data on sizes, shapes, compositions and other characteristics. **Federated Metals Div., American Smelting and Refining Co.,** 120 Broadway, New York 5. **L-11-1**

Grinders

Illustrated 28-page catalog deals with line of precision double spindle grinders; includes data on 16 representative types of work carrying fixtures which can be adapted to these machines. Drawings and specifications complete information. **Gardner Machine Co.,** Beloit, Wis. **L-11-2**

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"Since installation this Standard Tool Grinder has had no downtime . . . required no maintenance other than routine. We use the machine daily, sometimes continuously on production wet-grinding of carbide tipped hub-turning, offset turning, boring and other high-speed steel tools. It's by far the best precision grinder we've used."

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Induction Heating

Brochure illustrates ways in which induction heating equipment is used in industry, stressing speed, economy and other advantages. Covers principles of induction, practical applications, techniques and other interesting details. Also describes and pictures company's line of equipment and accessories. **Lepel High Frequency Laboratories, Inc.,** 55th St. and 37th Ave., Woodside 77, New York City. **L-11-3**

Welding

Pocket-size guide, "How to Get Better Welds," describes details of welding techniques and their applications, advantages, etc. Company also offers sample weld electrodes. **Hobart Brothers Co.,** Box DM-940, Troy, Ohio. **L-11-4**

Cutting Tools

Illustrated vest-pocket catalog of company's line of cutting tools also contains handbook-type information such as Morse, Brown and Sharpe, and National Standard taper data, decimal equivalents charts, tables of various thread standards, conversion tables and similar useful material. **Falcon Tool Co.,** P. O. Box 4605, Detroit 34. **L-11-5**

Tapes

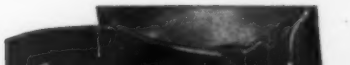
Slide-chart tap selector designed to keep basic tap information quickly available; helps user select correct drill and lubricant as well as proper tap for each job. Includes guide for both fractional and machine screw size taps and recommended drill sizes with decimal equivalents. **Threadwell Tap & Die Co.,** Greenfield, Mass. **L-11-6**

Safety

Handy pocket-size booklet "Working Together for Safety," designed as new employee rules manual contains instructions in safe work habits applicable to most plants. Cleverly illustrated. **National Safety Council,** 425 N. Michigan Ave., Chicago. **L-11-7**

Honing

Pocket-size illustrated 20-page booklet X-IBA-5001 displays products according to typical application, including both internal and external applications, together with outline of production data. **Sunnen Products Co.,** 7910 Manchester, St. Louis 17. **L-11-8**



DC Motors, Generators

Surface Cleaning

Bulletin No. 1500 presents detailed information on subject of blast cleaning from such points as why it is used and the background for this type of cleaning, to a discussion of its advantages of efficiency and versatility, the equipment used, economics involved, how special problems of individual jobs determine selection of type of cleaning, a study of various kinds of abrasives and their uses, and other pertinent information. Well illustrated. **Pangborn Corp.**, Hagerstown, Md. **L-11-8**

Alloy

Catalog VR-451 introduces alloy Tantung 144, to metal field where resistance to abrasion in cutting is important, and also gives ordering information on Tantung G, introduced earlier; includes photos, line sketches, dimensional and application drawings as well as outlines of machining and mechanical properties; also gives technical data on applications with speed and feed chart to show general Tantung cutting range as compared to high-speed steel and carbide. **Vascoloy-Ramet Corp.**, Waukegan, Ill. **L-11-9**

Metal Computer

Slide computer gives weights of strips, sheets, bars and plates of various metals and alloys; provides factors for steel, stainless steel, nickel, Monel, Inconel, aluminum, Hasteloy, copper and titanium. Reverse side condenses ASME Code giving basic specifications for fabrication of pressure vessels. **Continental Copper & Steel Industries, Inc.**, 345 Madison Ave., New York 17. **L-11-10**

Carbides

"Kennametal Cemented Carbides" gives technical data on Kennametal and Kentanium, including discussions of mechanical and physical properties, suggestions for design applications. **Kennametal Inc.**, Latrobe, Pa. **L-11-11**

Cutting-Off Blades

Illustrated brochure presents line of cutting-off blades, emphasizing details making up their quality, advantages in operation and other special features. **Pratt & Whitney** Div. Niles-Bemont-Pond Co., West Hartford 1, Conn. **L-11-12**

Reamers

Pocket-size reamer selector lists 143 hole sizes which can be reamed with company's standard tools, giving catalog numbers and equivalent sizes. **Lavallee & Ide, Inc.**, Chicopee, Mass. **L-11-13**

Storage

Brochure presents information on "Paltier System for Better Materials Storage", showing various methods and outlining advantages of each. Drawings clarify various points. **The Paltier Corp.**, 1701 Kentucky St., Michigan City, Ind. **L-11-14**

Spacers

Illustrated brochure deals with company's line of spacing devices, picturing their use for different applications such as in milling, drilling and grinding, etc. Includes specifications, and engineering drawings to show details clearly. **The Hartford Special Machinery Co.**, 287 Homestead Ave., Hartford 12, Conn. **L-11-15**

Gears

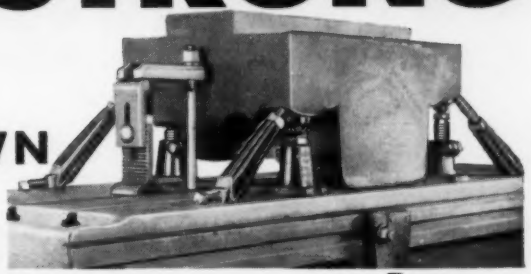
Thirty-six page bulletin CD-173, "Cone-Drive Gears at Work in Industry," illustrates 93 successful applications in 20 different industrial classifications to show extent to which double-enveloping worm gearing has helped improve design, performance, etc. **Cone-Drive Gears Div., Michigan Tool Co.**, 7171 E. McNichols Rd., Detroit 12. **L-11-16**

Power Tools

Illustrated Catalog 537 describes complete line of portable power tools; gives specifications and outlines of operations and use for each item. **Syntron Co.**, 340 Lexington Ave., Homer City, Pa. **L-11-17**

ARMSTRONG

SET-UP *and* HOLD-DOWN TOOLS



PLANER JACKS

NON-SKID JACKS

STEP BLOCK

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

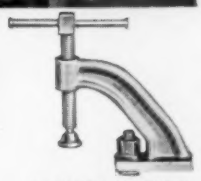
Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

Write for Circular

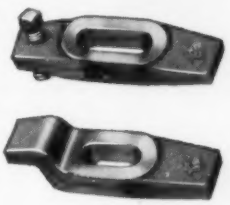
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5257 W. Armstrong Ave., Chicago 30, U. S. A.

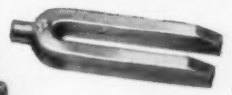
UNIVERSAL CLAMP

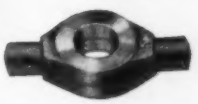
T-SLOT BOLTS AND NUTS



T-SLOT CLAMP

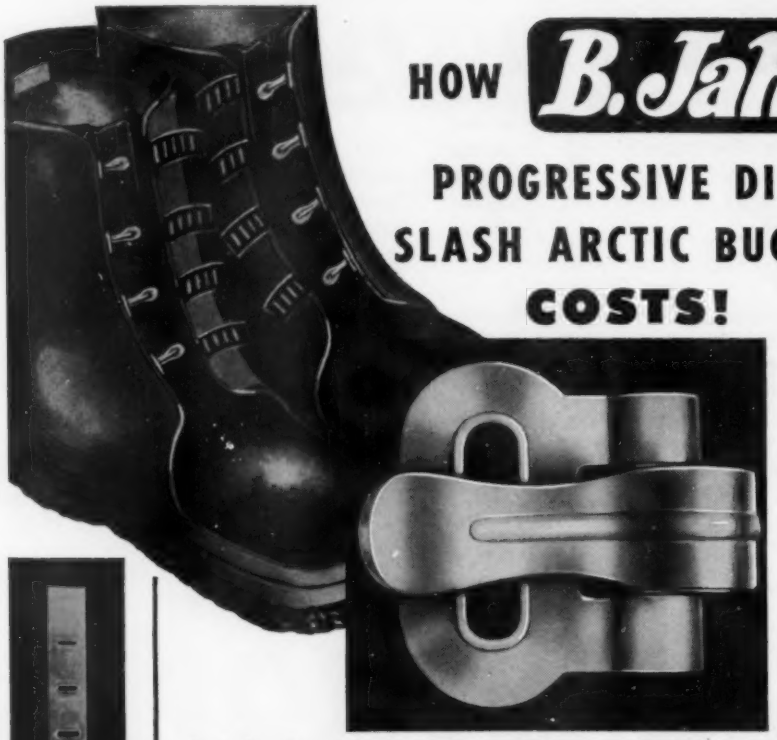




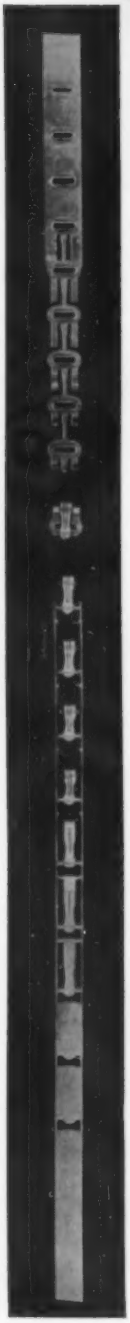


STRAP CLAMPS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-157



HOW B. Jahn PROGRESSIVE DIES SLASH ARCTIC BUCKLE COSTS!



Intricate dies by B. Jahn actually form and assemble 140 buckles—complete with "snap"—per minute!

The production of low cost arctic buckles represents another difficult — seemingly impossible — tooling bottleneck solved by B. Jahn design and engineering ingenuity. Not only was forming required, but permanent assembly as well — complete with spring clip locking feature incorporated into finished assembly.

DIE RIBBONS ILLUSTRATING DIRECTION OF FEED AND COMPLICATED TOOLING REQUIRED. 9 STATIONS ON EACH SIDE OF THIS PROGRESSIVE DIE TERMINATED IN A CUT-OFF AND ASSEMBLY STROKE.

The inevitable result — a progressive die — production proved by B. Jahn to deliver 6720 finished buckles per hour — all identical — each ready for assembly line use.

To guarantee the die's performance in customer's equipment to his complete satisfaction, more than 25,000 buckles were submitted for gauging and assembly line use before the die was certified "Production Proved" and shipped. Not only arctic buckles, but countless components from typewriter keys to carbine clips, cameras to loudspeakers can be mass produced IN LESS TIME, AT LESS COST, TO FINER FINISHES WITH B. JAHN PROGRESSIVE DIES.

SEND NOW FOR FACTUAL, PICTORIAL BROCHURE—"The Story of B. Jahn Production Proved Dies".

B. Jahn

THE B. JAHN MANUFACTURING COMPANY • NEW BRITAIN, CONNECTICUT

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DC Motors, Generators

Line of DC motors of ½ to 300 hp and DC generators of ¾ to 250 kw described in 16-page Bulletin 1450; photos and cutaway drawings show details of mechanical construction, available enclosures for different operating conditions, motor applications; includes section on motor-generator sets for converting alternating to direct current in industrial service. Describes electrical characteristics and shows features, advantages and application of shunt, series and compounds. **Louis Allis Co.,** Milwaukee 7, Wis. L-11-18

Carbide Tools

Indexed Catalog 51 displays complete line of double carbide tools with specifications, detailed description and engineering information for each. Technical data section contains helpful drill facts; hints on point grinding; tables on cutting speeds; pertinent tips on reamer use and care; useful data tables; tables of various standards specifications and other information. Request on business letterhead directly to company. **Chicago Latrobe Twist Drill Works,** 411 W. Ontario St., Chicago 10.

Hydraulic Maintenance

Recommendations for hydraulic oil selection and basic hydraulic system maintenance are presented in Bulletin 1300-S, "Hydraulic for Industrial Machinery," which covers characteristics of the oils, hydraulic system operation under normal and extreme temperature and humidity, and general maintenance procedures. Table outlines common problems and corrective actions for them. **Vickers Inc.,** Div. of Sperry Corp., 1416 Oakman Blvd., Detroit 32. L-11-19

Titanium

Two broaches deal with titanium and its alloys. One presents comprehensive discussion of properties of various grades, production methods and testing procedures. The second, "Preliminary Machining Recommendations for Titanium," outlines suggested procedures for turning, milling, drilling, tapping, grinding, reaming, and sawing this metal. **Mallory-Sharon Titanium Corp.,** Niles, Ohio. L-11-20

Impregnating

Catalog 760, "Vacuum Impregnation," gives details on range of applications for this process and the equipment used in vacuum impregnating; includes complete specifications for standard cylindrical and rectangular impregnating chambers, storage tanks and vacuum pumping units. **F. J. Stokes Machine Co.,** 5500 Tabor Rd., Philadelphia 20. L-11-21

Metal Cleaning

Technical folder explains company's recently introduced Soniclean process for the application of ultrasonic energy for cleaning of metal parts, giving details of principles and methods used, with graphs and diagrams to illustrate text. **The Detrex Corp.**, Detroit 32. **L-11-22**

Jigs and Fixtures

Most commonly used fixture details (such as rest buttons, fixture keys, swivel and dog point screws, etc.) included in 26-page catalog which furnishes full scale dimensional drawings for many items, providing the designer not only with an accurate perspective of the part, but with a usable template for tracing purposes. Includes price lists. **Harco Engineering**, 12092 Woodward Ave., Detroit 28. **L-11-23**

Tool Steels

Well illustrated brochure discusses principal characteristics for six oil and air hardening tool steel grades used in the metalworking industry, especially in basic production tools and dies; also outlines proper applications and correct methods of heat treatment. **Bethlehem Steel Co.**, Bethlehem, Pa. **L-11-24**

Bearings

Latest in design and application data on miniature ball bearings offered in comprehensive 20-page catalog; each bearing presented with description, identifying photo, scale drawing showing actual sizes available, and dimension chart and graph, also describes and illustrates applications where these bearings have proved helpful. **Miniature Precision Bearings, Inc.**, Keene, N.H. **L-11-25**

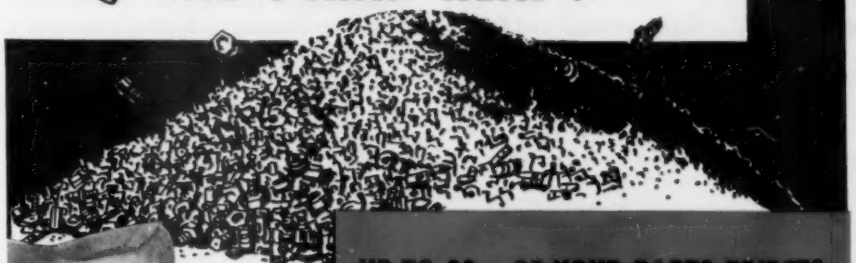
Machining for Jets

Bulletin 50731 describes in detail various machines and their sequence of operations used for machining jet rotor blades and buckets; also illustrates and describes two vertical machines used for machining compressor rotor disks, engine frames and other large round parts. Completely illustrated. **Ex-Cell-O Corp.**, 1200 Oakman Blvd., Detroit 32. **L-11-26**

Coatings

Eight-page bulletin "Adhesive, Coatings and Sealers," offered as useful selection guide, lists company's most important items in these lines, so tabulated with descriptions and illustrated examples of application to allow user to choose at a glance products most suitable to given problem. The Adhesives and Coatings Div., **Minnesota Mining and Mfg. Co.**, 423 Piquette Ave., Detroit 2. **L-11-27**

ARE YOUR PRODUCTION AND PROFITS GOING INTO THE SCRAP HEAP?



UP TO 80% OF YOUR PARTS REJECTS AND FIXTURE REWORK COSTS CAN BE ELIMINATED WITH THE VLIER AUTOMATIC TORQUE THUMB SCREWS

AVAILABLE IN FOUR TYPES

REGULAR —Type A for normal supporting

INVERTED—Type B Reverse of Type A support

TEE HEAD—Type C used with sliding V-blocks

ADJUSTABLE—Type D set your own holding pressures

HERE'S WHY—

VLIER Torque Thumb Screws are simple holding tools that give controlled support for even fragile work pieces against machine tool pressures. An automatic ball check in the head prevents further tightening once a pre-determined holding pressure is reached. Thus, no distortion—no rejects. These tools are operated by finger pressure only, and work without fail in noisy, greasy or dark places because they are *automatic*. Accuracy and uniformity are guaranteed and there is nothing to wear or break. It will pay you to apply VLIER Torque Thumb Screws to your production problem.

Send for Catalog No. 53

VLIER

VLIER ENGINEERING, INC.
4552 BEVERLY BLVD., LOS ANGELES 4, CALIFORNIA
Distributors of Spring Plungers, Spring Stops, Fixture Keys, Toggle Pads.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-159

North East West South IN INDUSTRY

Theodore W. Rundell has been appointed vice-president in charge of operations at Servel, Inc. He will have over-all responsibility for production and inspection, engineering and research, purchasing, personnel and labor relations, and product planning, though present personnel in direct charge of those various positions remain unchanged. Mr. Rundell has been vice-president in charge of engineering.

National Broach & Machine has announced the promotions of four executives to officers of the company: **Max B. Mentley,** formerly plant manager, was elected vice-president, manufacturing; **Ben F. Bregi,** who has been executive engineer, is now vice-president, engineering; **George R. Smith** was elected treasurer, and also a director; he previously was assistant secretary and assistant treasurer, posts now taken over by **D. Pierson Smith,** formerly sales administrator. Martin Linder, who has been cost supervisor, was made also assistant treasurer.

Messrs. Mentley, Bregi and Pierson Smith are all members of Detroit chapter of ASTE.

Precision + Speed + Power
...THIS VERSATILE MACHINE CAN REPLACE 2 OR MORE SINGLE-PURPOSE MACHINES
KNIGHT'S No. 50
Vertical Milling & Precision Boring Machine
A single solid-base machine with every essential feature for milling and accurate boring—an extremely versatile machine that will do the work of 2 or more single-purpose machines.
Work transfers are entirely eliminated
Set-up time is reduced to a minimum
Table feeds 5/16" to 20" per minute plus rapid traverse in all directions. 16 Spindle speeds from 40 to 2000 r.p.m. and infinitely variable boring feeds from .0005" to .010".
Convenient quick-action controls—full-vision work areas—easy operation. Powerful all-gear 7½ H.P. drive—extra-rugged construction.
Write For Catalog
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W. B. KNIGHT MACHINERY COMPANY
3920 West Pine, St. Louis 8, Mo.
Send catalog on No. 50 and other Knight Milling Machines.
NAME
TITLE
Send information on Knight's 20" & 42" Rotary Tables.
KNIGHT VERSATILE MILLERS ACCURATE-RIGID
W. B. KNIGHT MACHINERY CO.
3920 WEST PINE BOULEVARD • ST. LOUIS 8, MISSOURI
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-160

J. Doyle DeWitt has been elected to the board of directors of Niles-Bement-Pond Co., succeeding Hubert D. Tanner who until his recent retirement was vice-president of the company.

At the same time **Louis Reiss** became treasurer of the firm, succeeding Richard W. Banfield who has been treasurer as well as vice-president. As vice-president, Mr. Banfield will devote full time to managing the company's Small Tool and Gage Divs.

J. D. DeWitt

C. F. Jensen

According to a recent announcement, **Carl F. Jensen** has been appointed plant manager of the Des Plaines Stamping plant of the Shakeproof Div. of Illinois Tool Works. Mr. Jensen, who joined Shakeproof in 1941 as a senior draftsman, has most recently filled the position of special stampings manager. In addition to his new assignment, he will continue to be responsible for the company's special products engineering and sample parts operations.

The board of directors of M. E. Cunningham recently announced the election of **F. S. Speicher, Jr.,** as president and treasurer; **F. S. Speicher, Sr.,** vice-president in charge of research and development; **Walter J. Speicher,** vice-president in charge of sales and secretary; **William G. Kratz,** vice-president in charge of production. Mr. Speicher, Sr., had served the company as president.

The appointment of **Harold O. Smith** as general manager of operations for the plants in Salen and Warren, Ohio, has been announced by the Mullins Manufacturing Corp. Mr. Smith has been works manager of the Salem plant, and remains as acting works manager.

At the same time, **A. P. Schmauch** was named chief industrial engineer. Mr. Schmauch comes to Mullins from Rockwell Tools, Inc. where he was general manager.

Judson Neff has been named manager of all manufacturing and production operations in the Pittsburgh and Midland, Pa., plants as well as manager of the engineering and estimating departments of Mackintosh-Hemphill Co. Mr. Neff, who has an extensive background in production management and engineering, has for the past few years been associate professor of production at the University of Chicago.

As of November 1, **Maj. Gen. Emerson L. Cummings** will be chief of ordnance of the U.S. Army, succeeding Maj. Gen. Albert L. Ford who retires on Oct. 31. Gen. Cummings has been serving as assistant chief of ordnance in charge of the industrial division. Readers of THE TOOL ENGINEER will remember Gen. Cummings as the "Man on the Cover" of TE's December, 1951 issue.

The post of plant metallurgist at Rodney Metals, Inc., has been filled by the appointment of **Ross B. Hopkins.** Mr. Hopkins has been associated with American Steel & Wire Co. for the past 13 years.

R. B. Hopkins

C. C. Reiff

Charles C. Reiff, formerly chief engineer of Rockwell Manufacturing Co.'s Barberton, Ohio, plant, has been promoted to the position of chief engineer of the company's Delta Power Tool Div. at Bellefontaine, Ohio. Mr. Reiff joined Rockwell in 1950 as a design engineer.

At a recent meeting of the board of directors, **L. H. Geddes** was named executive vice-president of Greenlee Bros. & Co., and of its subsidiary, Greenlee Tool Co. Mr. Geddes was formerly vice-president of the parent company. At the same time **D. E. Hawkinson** was elected vice-president of Greenlee Bros. in charge of machine tool sales, and **R. J. Samuelson** was elected vice-president of Greenlee Tool in charge of tool sales. **R. O. Knudson** was made assistant sales manager of special metalworking machinery, and **C. P. Block** was named assistant sales manager of automatic screw machines.

Messrs. Hawkinson and Knudson are members of ASTE Rockford chapter.

The board of directors of Crucible Steel Co. of America has appointed **Seward H. French, Jr.,** as a vice-president of the company. In this position he will be in charge of industrial and public relations and will be the company's spokesman in these matters.

George E. Robotham has been named chief draftsman, of the Chandler Evans Div., Niles-Bement-Pond Co. Mr. Robotham was formerly a technical assistant on the Ford Motor Co.'s manufacturing staff.

Bryant Machinery & Engineering Co. has announced the appointment of **Martin J. Wiora** as president of the company. Other corporate officers appointed include **Charles B. Tansley** as executive vice-president; **Robert A. Cole,** vice-president; **Daniel F. Laffey,** secretary; and **Martin J. Wiora, Jr.,** treasurer.

The International Machinery Co. has announced the election of **Milton D. Thalberg** to presidency of the company.

Breech Lock for Quick Change
Roller Bearing Stop Collar
Actuated Cross Facing—
Removable Tool Posts
DIA. 18
Removable Tool Blocks
and Boring
Cast Magnesium Body Statically Balanced
Bar of Welded Steel Tubing
Tool Bits held in independent Tool Posts and Tool Blocks can be sharpened and re-set to predetermined dimensions, then placed in the Tool Body without further adjustment.

TOOLING by GAIRING

Top machine tool builders rely on GAIRING to design and produce the cutting tools that make their special machines perform their best under the most exacting production requirements • GAIRING's reputation with these leaders in metalworking has been earned by over 35 years of service to the industry • You too may well rely on GAIRING for *your* requirements in both special and standard cutting tools. Ask us to have our nearest representative get in touch with you

The GAIRING TOOL COMPANY • 21223 Hoover Road • Detroit 32, Michigan

In Canada: A. C. Wickman (Canada) Ltd., Queensway, Toronto 14.

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Smoking tools scream...

LOOK OUT FOR FIRE!

Cutting oils smoke because they're heated to the burning point at the tool edge. That's bad for production but, worse yet, it points to a fire hazard. Oil vapors and oils in storage, oil soaked clothing and floors may all contribute to the rapid spread of flames.

No fire hazard exists with all-chemical Lusol metal working solution in your machines. It can't burn, since it contains no oil. Workers' clothing and workroom floors stay cleaner. It doesn't smoke, no matter how hard you work it, so the air is clear in shops employing Lusol.

You also gain production

Because Lusol contains no petroleum oil, it carries heat away from cutting tools faster. Machines can be run at higher speeds . . . tools last longer and you hold fine finishes and dimensions, since you're not burning cutting edges. Good shopkeeping is easier, with its resulting higher safety and better employee morale.

These are facts proved in hundreds of shops. The booklet, *Lusol Gets to the Point*, gives you proof. Write for a copy or for help in testing Lusol in your own shop. F. E. Anderson Oil Company, Inc., Box 213-R, Portland, Connecticut.

Lusol... ***ALL-CHEMICAL METAL WORKING SOLUTION***

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-162

Abstracts of Foreign Literature

By M. Kronenberg

Kinematics of Lapping

An article published in the August 1953 edition of Werkstatt und Betrieb reports a study made by H. Finkelnburg of the kinematics involved in the lapping of plane surfaces. Various types of lapping machines and their drives are discussed, among them one developed in Russia as well as others using the eccentricity of three drive shafts to produce the desired lapping pattern. The conclusion reached is that neither such a movement nor the straight line motion in parallelograms gives highest efficiency and greatest accuracy of the parts being lapped.

The relative motion between workpieces and lapping wheels produced by planetary drives is considered. A simple mathematical relationship is developed for calculation of the required speeds of the various motions involved. In addition, the article reports on a new method of measuring photographically the actual lapping pattern that permits predetermining various data required for highest lapping accuracy. Twenty-six illustrations include vector diagrams, lapping patterns and photos of the results of the measuring method employed.

Tracer Controlled Guideway Grinder

Application of tracer controls to grinding of guideways is described by G. Klewer in the August 1953 issue of Werkstatt und Betrieb. A template cut to the contour of the section through the guideways of a lathe bed is taken as an example of this process. It differs from commonly known copying methods in that the tool (grinding wheel) is not controlled on its entire path by the template but only at the end of the bed where the template is contacted by the tracer finger that closes an electric contact which in turn feeds the wheel towards the guideway at a predetermined rate. This tracer control continues feeding the wheel until the desired dimension has been reached when the machine is automatically stopped. It can then be switched to hand control for a finishing cut measured by Johanssen blocks attached to the template. The device may be considered a combined

feeds that would give best performance.

electric gaging and control mechanism. It is claimed that considerable time is saved because it is no longer necessary for the operator to make measurements of the various surfaces when grinding a complex contour.

Deep Drawing Press

Hydraulic presses are generally preferred in deep drawing when the ratio of height to diameter is great because of more favorable conditions for the plastic deformation of the material. In an article by E. Mosinski in issue number 8 of Werkstatt und Betrieb, it is claimed the use of such presses requires high investments and increases production cost due to the low production of such machines. A deep drawing press developed by one of Germany's largest manufacturers is described that offers the advantages of a hydraulic press without its low production rate. By providing two crankshafts the type of motion curve of the slide is obtained to produce the desired plastic flow of the material. While a single crank press is characterized by a sinosuidal motion of the slide, the slide in the new machine goes down with increasing speed for the first 60 degrees of the rotation of the crankshafts, but maintains a constant speed the following 100 degrees rotation, permitting a kneading of the material. The return stroke speed of the new machine is considerably higher than normal.

Forces and Velocities of Mechanical Presses

A mathematical analysis of the forces and velocities encountered in mechanical presses is offered by H. Maekelt in issue number 8 of Werkstattstechnik und Maschinenbau. The energy stored in flywheels, their moments of inertia, the energy dissipation during pressing, efficiency and slippage, are discussed with other data useful to the designer of presses and to tool engineers.

Carbide Milling with Rotary Files

Research has been carried out for a number of years on cutting speeds and feeds rates for carbide milling cutters used on mechanically operated milling machines. Scant information is available, however, on the performance of carbide cutters of small diameters such as burs and rotary files. Some publications claimed, according to an article by K. Lange in the August issue of Werkstatt und Maschinenbau, that cutting speeds up to 3,000 ft. per min. would be feasible. This is contrary to practical experience. Hence, the author has carried out an investigation at the Hannover Institute of Technology to determine tool life, cutting speed and

Never Before

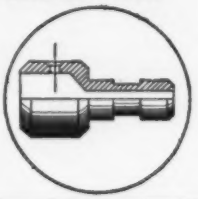
SO MANY ADVANTAGES for HIGHEST PRODUCTION

4800 PER HOUR!
3800 PER HOUR!
2500 PER HOUR!

SNOW
FULL UNIVERSAL MACHINES

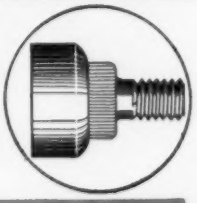
Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING
Crossdrill and C'T" Sink 1/16" Hole
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine



TAPPING
Tap Two #10-32 Holes
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine

THREADING
3/8"—24 Thread—1/2" Long
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

SNOW
MANUFACTURING COMPANY
435 Eastern Ave., Bellwood, Illinois
(Chicago Suburb)
Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

Submit Sample Parts for Production & Cost Estimates

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CONNECTICUT

DURAKEEN BROACHES

DURABILITY WITH KEENNESS

The quality of a broach is not only on the surface . . . it must go clear through to the core. With the finest steel heat-treated to exact temperatures and exposures, and precision machining, Connecticut Durakeen Broaches give you more pieces per grind, more grinds per broach . . . and better quality work.

The performance of a Connecticut Broach is determined to a mathematical certainty before the steel is touched . . . before a tooth is cut. A Durakeen Broach has no uncertainty in it . . . at any stage of its making or use. "Better Broach it with Connecticuts!"

THE CONNECTICUT BROACH AND MACHINE COMPANY
NEW LONDON, CONNECTICUT

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feeds that would give best performance.

The cutters had a diameter of ½ and ¼ inch respectively, between 18 and 48 teeth according to type and a helix of 10 degrees. Only cutters with negative true rakes of 16 to 20 degrees were used. The tests were run on die-steel heat treated to Brinell hardness of about 200, 400 and 700 respectively. The testing method used differed from conventional procedure in that the feeding force was kept constant instead of the feed rate. A wear land of about 0.001 inch was taken as the criterion for tool life as against 0.030 inch in conventional milling because wear increased rapidly after reaching this value.

The force required using these cutters was determined in an additional series of tests, indicating that not more than 10 lb. could be exerted by the hand of the operator without undue fatigue. This force was taken as the maximum for the mechanical feed used in the testing device. The cutting speed was increased to more than 3,000 ft. per min. although it was found that the hot chips became welded to the surface, thus producing a poor finish.

Depending on cutter diameter, pitch and material to be machined, a minimum cutting speed of 600 ft. per min. and a maximum cutting speed of 2,000 ft. per min. gave best performance and tool life. These high cutting speeds, not used to any extent in steel milling as yet, may be due to the low frictional force at the cutting edge and to the cutter design with negative true rakes. The surface finish at these speeds was better than that obtained with hand grinding and a fine grit (60), particularly when measured across the feed marks. The finishes were 0.000240 inch with the carbide cutters as against 0.000640 inch for grinding. In the direction of the feed marks the difference was less, namely 0.000120 inch as against 0.000160-inch roughness. The high surface finish with burs was obtained when the cutters began to give out. Tests showed a surface roughness of 0.001 inch with dull cutters. Optimum value for the depth of cut was 0.010 inch. At larger depths of cut the forces increased rapidly while the cutter no longer cut when the stock removal was less. Other data in the article pertain to the cutting forces, effect of pitch, material to be machined and chip formation.

Service File Sharpening Co., 4461 W. Jefferson Ave., Detroit, has reports that it now can successfully resharpen all types of American and Swiss pattern and Vixen files, including chain link band files, by a method evolved as a result of extensive research.

GET LONG LIFE . . . ECONOMY

Technical Shorts . . .

POSSIBILITY of a new series of sintered metal products is anticipated as a result of current research and development work being done by Naval Research. Success in this direction might mean considerable improvement in high-temperature strength properties of the relatively pure metals, and also savings in alloying elements, according to Julius J. Harwood, of the Office of Naval Research.

Combinations of metals and ceramic materials are believed by some experts to hold the answer for the high-temperature strength properties sought since metals generally give good workability and shock resistance and ceramics provide high-temperature strength. Further, powders of both are sintered and formed to desired shape.

Another program, being carried on at Wright Air Development Center in Dayton, is examining the matter of high-temperature corrosion and oxidation resistance in low-alloy steels. Researchers are looking for possibilities of depositing protective surface coatings on steel, with the thought in mind of effectively reducing amounts of nickel and other critical metals now required in applications, such as engines, where high temperatures are encountered. Should these researchers find the answers, they anticipate faster jet planes, more efficient electrical power plants and more durable nuclear reactors.

* * *

RADIATION detection devices which figuratively "see the heat" comprise the heart of a recently developed robot system said to be 10 times faster and 2 to 5 times more accurate than previous systems in monitoring critical temperatures during uranium rolling operations, the Minneapolis-Honeywell Regulator Co. reports.

The system, developed by the firm's Industrial Division is believed to be the first ever designed to supervise automatically this phase of production rolling of uranium ingots. It was installed in the recently opened uranium mill built by Birdsboro Steel Foundry & Machine Co., Fernald, Ohio. The A.E.C.'s Ohio production center is now in volume production rolling uranium into ingot bars later used to produce fissionable materials.

W. P. Wills, director of the division's research and development activity, explains that the objective was to improve the accuracy of temperature measurements which are important to uranium and other rolling processes. The radiation devices, called Radiamatic pyrometers, function as "pick-up" elements which are comparable to electric eyes. They detect the temperature of the uranium ingot and relay the information to a series of electronic recording instruments. This information, which may report temperature conditions at several points in the production line, permits a single operator to make necessary adjustments.

By conventional procedures mill operators determine temperatures by utilizing colored crayon sticks, each with specific melting points. To ascertain ingot temperatures the operator stops the operation and marks the ingot with the crayon stick. If the crayon stick with a melting point of 1000 degrees F, for example, melts on application, the operator knows the ingot is at least that hot. A crayon stick with the next highest temperature is then applied. If this doesn't melt, the operator then calculates the ingot temperature to be somewhere between.

By permitting measurements while the ingots are being processed, the M-H system markedly speeds up the production operation. John Werme, M-H nuclear engineer, estimates that the electronic system provides a temperature reading, at one or a dozen

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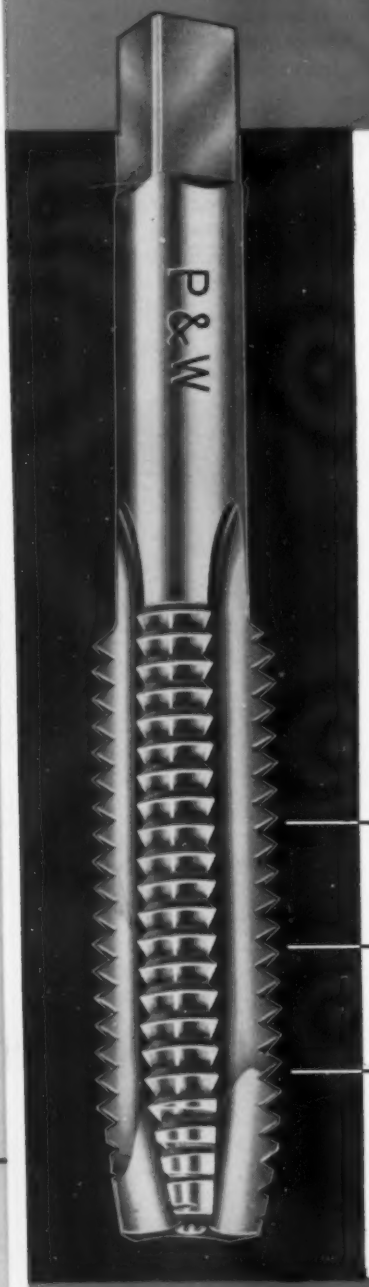

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Cut Thread Taps are available from stock in all standard types and sizes shown in Circular No. 541. Special cut thread taps are made to meet your requirements.

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points, in about 1 or 2 seconds, or 10 times faster than the crayon method. The accuracy of the temperature reading is also improved.

The automatic monitoring is similar to systems developed by the company for use in steel mills to determine temperatures of processed steel.

* * *

TEMPERATURE CHANGES as infinitesimal as 0.0005 of one degre in high-altitude guided missiles may be detected by a device about the size of an aspirin tablet. According to the Carboloy Dept. of General Electric Co., who have turned out this tiny instrument, it is so sensitive to temperature changes that a puff of breath can cause it to increase current in an electrical circuit.

Known as Thermistor, the device is used in connection with electronic systems or in applications where precise temperature control is essential.

As an example of their use, auto makers immerse a Thermistor in the cooling system of engines under development to control water temperatures. In another instance, industrial oven heat can be controlled with the device.

* * *

A METHOD of laminating vinyl plastic and sheet steel or aluminum which is reported to render these metals permanently rust and corrosion-proof has been developed by the Naugatuck Chemical Div., United States Rubber Co. More than 20 manufacturers of containers, business machines, chemicals, metals, and allied products are now experimenting with the process which combines the structural strength of metal with the bright colors and exceptional corrosion resistance of vinyl plastic. The company believes it to be one of the most significant advances for the metals and plastics industries in the last decade. To date, cold-rolled steel, hot-rolled pickled steel and aluminum, from 18 to 34 gage, have been used to make the laminate. The vinyl films used have ranged from 0.002 to 0.02 inches thick.

The process consists of bonding Marvinol, Naugatuck Chemical's vinyl, to sheet steel or aluminum. The resulting laminate, called Marvinol-Metal Laminate, is said to have a higher abrasion resistance than varnish, paint and baked enamel finishes. In addition, the bond of the plastic to the metal has been found to be strong enough to resist 180-degree bends and deep draws without separating the vinyl from the metal.

The laminate is made by rolling rigid or semirigid Marvinol vinyl sheet onto heated adhesive-coated metal sheets or strips. The rolling pressure is not high. After rolling, adhesion is effected in

HPE *Automatic* Magazine Loading

consistency, ready for application with a wipe-on tool or spray equipment. A high solids content speeds drying time

seconds under heat lamps or another suitable heat source. Secret of the process lies in a special adhesive, and proper preparation of the metal and the vinyl plastic compound.

Easy adaption to high-speed production for fabricating either continuous rolls or individual panels, is a further practical aspect of the process.

Tests on the finished laminate indicate an adhesion in excess of 40 pounds per square inch of width. This high adhesion permits the laminate to be fabricated with all types of regular metal-forming equipment without damage to the coating.

The laminate can be sheared, drilled or punched without chipping. Crimp rolls, 90-degree crimp bends, 180-degree bends and deep draws can all be made without damaging the coating. There are no special techniques required, and the only limitation in fabrication is that soldering, welding or brazing cannot be used without removing the coating for a short distance on either side of the seam. However, joints and exposed metal at cut edges can be protected by pressure sensitive tape.

In a series of corrosion tests, laminated panels have been left outdoors in an industrial atmosphere for two years without breakdown. In other tests panels have been exposed to 100-percent humidity, at 160 degrees Fahrenheit, for 1,000 hours without adhesion failure or blistering, and with only slight color changes. Oven ageing at 150 degrees Fahrenheit for 600 hours had no perceptible effect on adhesion or color.

Abrasion tests indicate the new laminate is superior to conventional metal coatings. However, if the coating is cut, or worn through, it will not necessarily rust because the adhesive and prebonding treatments are corrosion deterrents.

Costwise, the laminate is higher than galvanized iron, yet about one-third the cost of comparable gage stainless steel. Some of the products which can be made from the plastic-metal laminate are decorative and weatherproof building siding, interior paneling, colorful lawn furniture, office and industrial machine housings, inexpensive corrosion resistant containers for chemicals, chemical piping and ducts, truck and trailer body panels, counter tops, shelving and lockers, and office furniture.

* * *

PRODUCTION OF the emulsion known as the Carey Sound Deadener will permit manufacturers of light metal equipment to give their products a heavy solid feeling with sound hushing ability, according to The Philip Carey Mfg. Co. of Cincinnati.

The sound deadeners are of a fluid

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Ready for prompt shipment!
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COMMERCIAL GROUND HIGH
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Now you can get . . . from stock and at standard prices . . . Pratt & Whitney "CGH" Commercial Ground Thread High Limit Taps made to a higher tolerance range to take full advantage of the expanded tolerances established by the new Unified and American Screw Thread specifications. MORE HOLES PER TAP — LESS COST PER HOLE. Regularly furnished styles are listed in P & W Catalog No. 17 as No. 103, No. 104 and No. 106.
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MACHINE TOOLS • CUTTING TOOLS • GAGES

LIPE *Automatic* Magazine Loading BAR FEED

Averages Net Gain of 78% in running time!

Another Record

THE JOB . . . At L. C. Smith & Corona typewriter plant, Syracuse, N. Y., such operations as cut-off, chamfering, shaping ends, knurling were done on 14 different jobs, ranging in length from 5¼" to 16¼". A Model 00 B & S Screw Machine having a Lipe Automatic Magazine Loading Bar Feed attached, was used.

THE RESULTS . . . On running time alone, a net gain of 78% was averaged over the 14 separate jobs. And that's not all! A minimum of 30% was also gained in production because the screw machine does not "cut air" when it is left running unattended by the operator. Therefore, the overall result on these widely varied jobs is an average increase in total production of 108%.

BIG Production Gains

on a great variety of work Because . . .

- *Stock is fed to screw machine all the time—not dependent on operator.*
- *Feed-out pressure always behind stock.*
- *Eliminates feed fingers.*
- *Avoids multiple feed finger feed-outs.*
- *Model AML gives maximum output of machine—no "cutting air".*
- *Saves in changeover set-up time.*

Upon request we will be glad to send you a time chart showing the separate savings of the 14 jobs referred to in the case history above. Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers are glad to study your problem. No obligation.

LIPE ROLLWAY — *Lipe*-ROLLWAY CORPORATION, Syracuse 1, N. Y.

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consistency, ready for application with a wipe-on tool or spray equipment. A high solids content speeds drying time. The applied film bonds permanently to metal and remains in place indefinitely. Once dry, it can be painted with emulsion type paint, or prior to drying, it can be sprayed over with a quick-setting lacquer or thermo-setting enamel. The emulsion can be baked at temperatures as high as 325 degrees F without loss of bond, blistering, flow, or without any striking through of the paint, except when light shades of colors are used, the manufacturer says.

* * *

INFORMATION ON what is offered as a superior method for pouring steel has been released by the Navy Office of Information.

Main feature of the method has to do with avoiding the problems surrounding accumulated harmful gases and impurities which heretofore have interfered with casting.

In the production of steel, aluminum is added as a final deoxidizer and degasser when the steel is poured from furnace to ladle. However, the aluminum may not always mix properly with the steel. The first gush of slag may envelop the aluminum, thus carrying it to the top of the ladle where it cannot blend satisfactorily with the molten steel that comes after. Obviously this prevents the aluminum from accomplishing the intended work, and the impurities and harmful gages remain to cause trouble for casting operations.

According to the simple technique devised by Norman T. Quigley of the Puget Sound, Wash., Naval Shipyard, a burlap sack is stuffed into the tap hole just before pouring. The furnace is then tipped until the slag is above the top hole. When the sack burns out, the first gush is steel, not slag, and a thorough blending results.

* * *

GIANT CARBON-BONDED, silicon carbide crucibles which hold as much as 1100 pounds of lightweight aluminum are possible as a result of a recently developed process announced by Electro Refractories & Abrasives Corp. The process, according to the company announcement, imparts a laminated structure that increases the strength and flexibility of the crucibles. Previously, the company could produce crucibles holding only up to 400 pounds of aluminum.

Development of these crucibles was encouraged by the demand by the die-casting industry for increased sizes in pots and other furnace equipment in foundries.

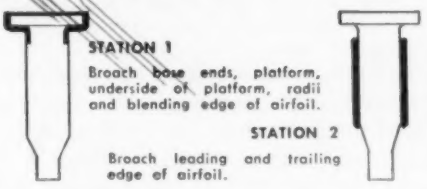
broken tools made like new

Broaching jet blades

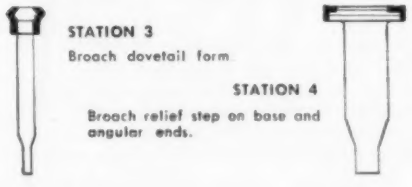
American Dual Ram Surface Broaching Machine performs 4 operations on stainless steel blades

To broach stainless steel jet compressor blades, American installed standard vertical hydraulic dual-ram surface broaching machines with tilting work tables. Each machine was arranged with 4 broaching stations, two at each ram. One of each of the operations shown are performed at each of the 4 stations. The parts are automatically clamped and unclamped with the operator loading the stations at one ram while the other is broaching.

For answers to your broaching problems write to American — the company that makes all three — machines, fixtures and broaches.


STATION 1
Broach base ends, platform, underside of platform, radii and blending edge of airfoil.
STATION 2
Broach leading and trailing edge of airfoil.

HERE ARE THE FOUR JET BLADE SURFACES BROACHED



Catalog #300 illustrates and describes American surface broaching machines. Send for a copy for your files.

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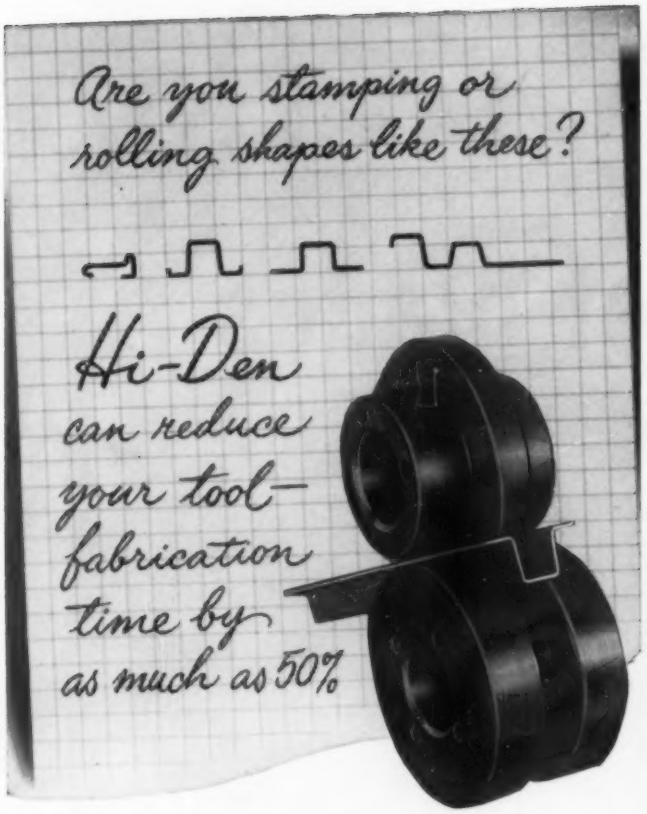
See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



A large aircraft manufacturer* reports HI-DEN rolls in a Yoder machine produced these short-run parts in stock sheared from sheet aluminum (in as-quenched condition) more satisfactorily and economically than other methods tested. And *tool fabrication time was reduced* 50%.

Another company* found that a steel draw die which formerly required three passes to complete a draw, when faced with HI-DEN completed the same draw in one pass. HI-DEN *treats the metal better.*

More than 100 different applications for HI-DEN have been reported by users . . . forming, stretch, draw and press brake dies; jigs, fixtures, templates, pressure pads and many others. Ideal for use in Hydro-form or Mar-form presses.

HI-DEN, a compreg of selection wood veneers impregnated with phenolic resin (laminated and compressed under extreme heat and pressure) is far stronger than equal weight in steel, is lighter in weight, easier to handle, resistant to oil, alcohol and moisture, dimensionally stable — and is easily shaped with standard tungsten carbide tools.

**Names on request*

If you are forming light metal parts, HI-DEN has important advantages to offer. Why not send today for Technical Bulletin and literature showing how to improve quality while lowering costs?

P.S. HI-DEN's companion product, Parkwood 8000 (a kraft paper impregnated laminate) is becoming popular for bench tops . . . smooth, hard, but resilient, it won't burn and scratch assemblies of aluminum alloy and other softer metals.

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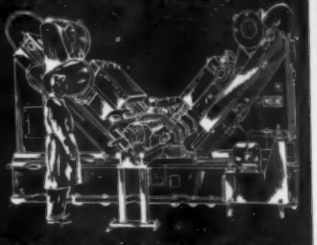

Boring V-8 Engine Cylinders

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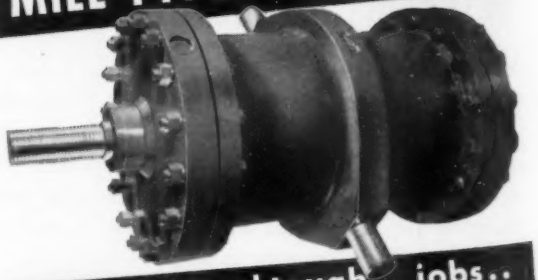
MILL TYPE CYLINDERS



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Lindberg also builds a standard catalog line of heavy duty air and hydraulic cylinders . . up to 12". Hydraulic Cylinders available in 1500 and 3000 PSI. Ask for bulletin #731 (air) . . #701 (hydraulic).

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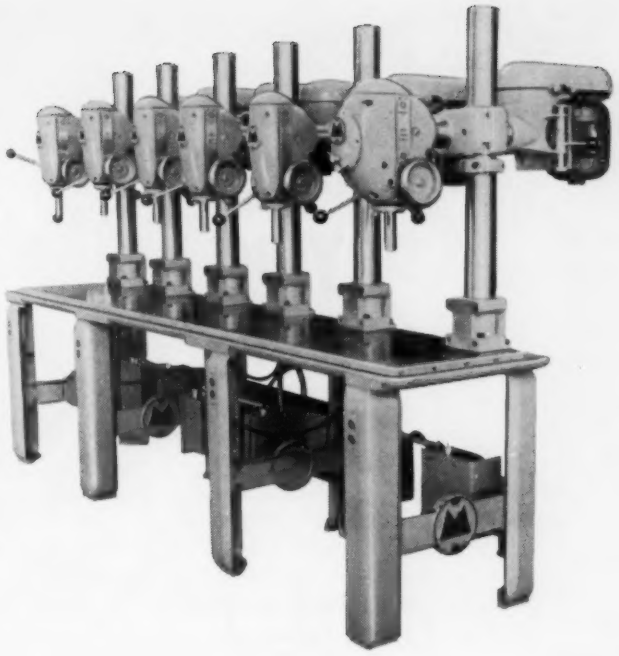
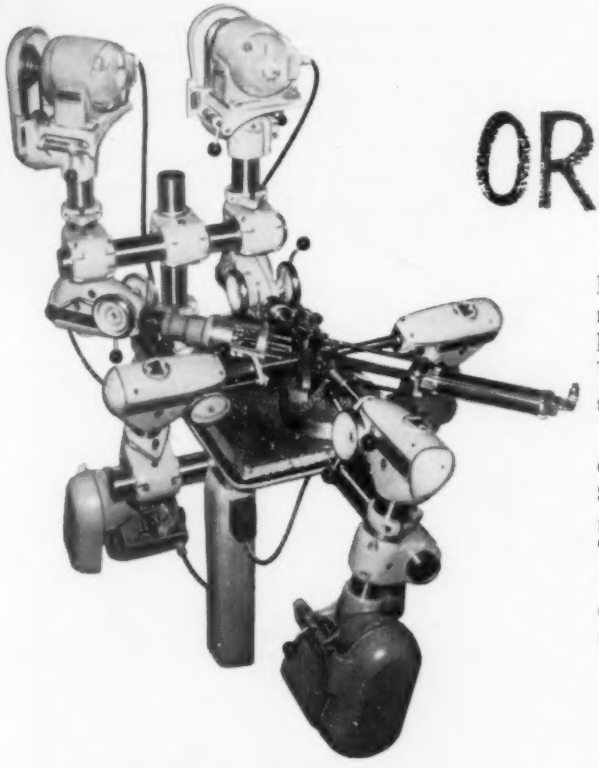
ONE AT A TIME



Used conventionally, MAGNA DRILL is one of the finest drill presses on the market.

With 1 h.p. motor, it drills 1" in cast iron, ¾" in steel, has a 5" stroke . . . adjustable throat drills to the center of 28" circle. Spindle speeds: 380 to 6860 r.p.m.

MAGNA DRILL drills, reams, counterbores, taps, countersinks, spotfaces and grinds. Package mechanical feed attaches in a few minutes to the drill head; feed rates .003" to .012" per r.p.m. Automatic cycling. Prices for MAGNA DRILL components are F.O.B. destination: drill head (less 1 h.p. motor), $285; column and base, $48; tables, $185 and $235; power feed, $195; lead screw tapper, $260; speed reducing quill, $160.



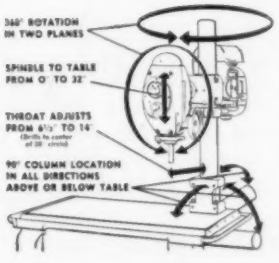
OR ALL TOGETHER

MAGNA DRILL can be set up quickly to drill or tap any number of holes in any number of planes, *all at one time.* Each head can have its own speed, feed, drilling angle. You can change setups *without special tooling* in a very short time; if necessary, *overnight!*

On the left, you see a MAGNA DRILL setup at a west coast plant. It has cut machining costs from $1.10 to $.16 per unit (high-pressure bronze valves), reduced number of rejects, and improved the quality of work! This company uses MAGNA DRILL for four operations: (1) drilling and tapping 4 holes; (2) core drilling and counterboring two holes; (3) facing and counterboring one hole; and, (4) pipe tapping one hole.

ONLY MAGNA DRILL DOES BOTH!

Wouldn't you like to learn more about MAGNA DRILL? Just fill out and mail the coupon. No obligation!


360° ROTATION IN TWO PLANES
SPINDLE TO TABLE FROM 0" TO 32"
THROAT ADJUSTS FROM 6½" TO 14"
90° COLUMN LOCATION IN ALL DIRECTIONS ABOVE OR BELOW TABLE

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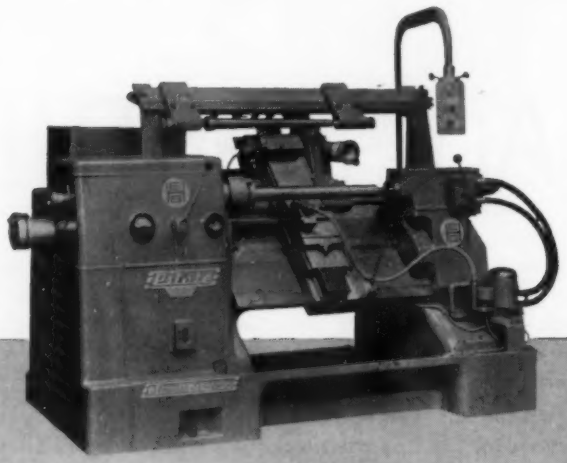
Why use a dozen tools when the H.E.B. *with just a few* does the job faster, better and at less cost! Incorporating the patented H.E.B. tracer device these versatile machines give you maximum output at high speed with remarkable accuracy and finish.



H.E.B. PILOTE COMPLETELY AUTOMATIC HYDRAULIC COPYING LATHE

The first *completely automatic* hydraulic copying lathe. The operator has only to load the machine and *press a button* to start the cycle. When the part is finished the tool returns to its starting position and the spindle stops automatically! Savings in setup time and tooling costs are enormous. Motors to 60 H.P.

COMPLETELY AUTOMATIC

H.E.B. HIGH SPEED HYDRAULIC COPYING LATHE

This absolutely rigid, chatter-free machine with built-in tracer device eliminates costly down time, takes no more than 10 to 20 minutes for setting up and the finished parts are copy turned up to 300% faster than on multi-tool lathes.

The OP Model, with its 20 H.P. motor, takes heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM. GT Models with rotating pattern are designed to copy an infinite variety of non-circular work.

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These machines are designed and built in France by H. Ernault Batignolles, machine tool manufacturers for almost a hundred years. If you want more information about tomorrow's turning methods, then write, wire or telephone now for a demonstration or catalog. See our insert in Sweet's Machine Tool Catalog.

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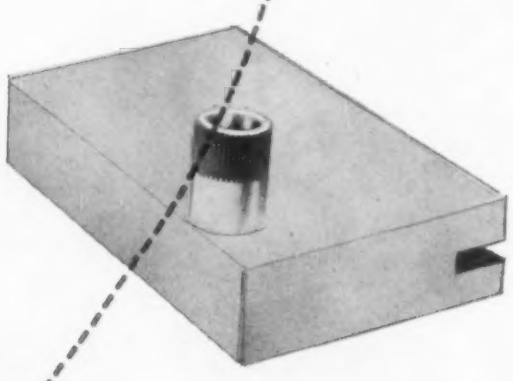

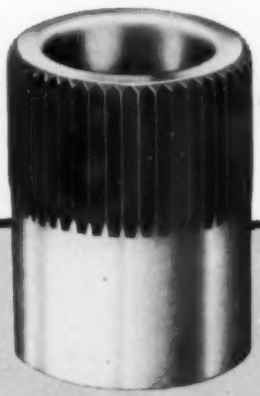

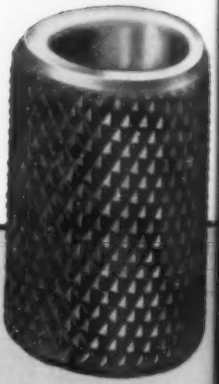

For use in fibreglas, wood, plastic, masonite and soft metal tooling! American Serragrip drill jig bushings can be pressed into softer materials without shearing. The serrations on the drill bushings are made to ease their way in without tearing the material. Once in, the American Serragrip drill bushing's exclusive design will not permit slipping or rotating. You'll save time and money if you specify American Serragrip drill bushings.

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SLIP RENEWABLE

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LOOK TO American FOR A COMPLETE LINE OF DRILL JIG BUSHINGS

Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools

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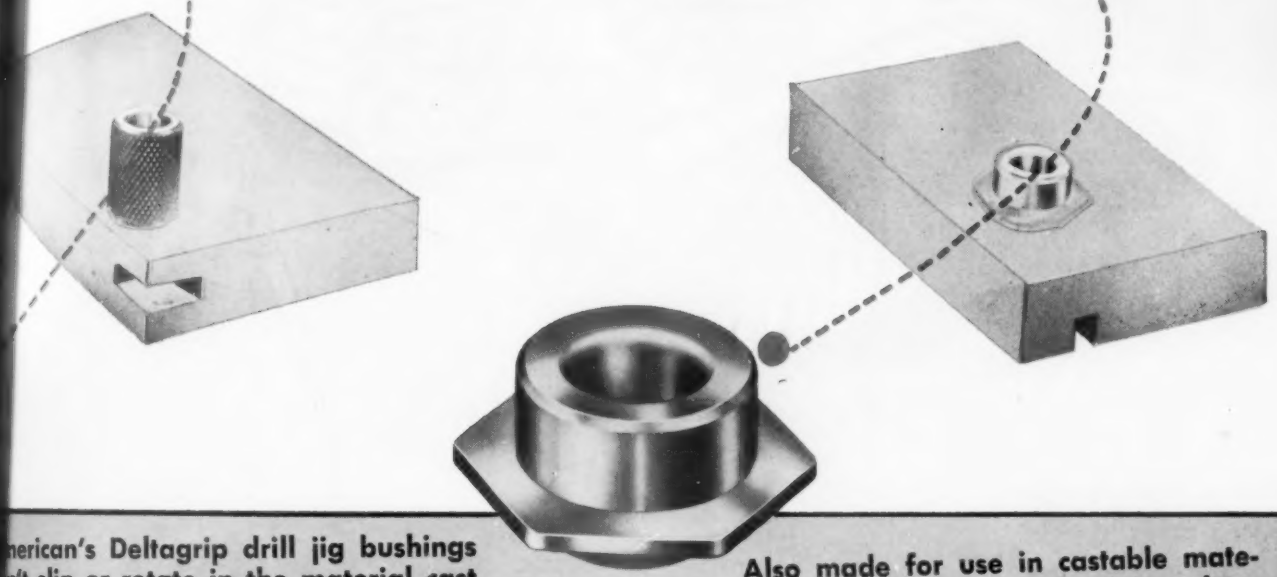
Three new drill jig bushings that will save you money! Call or write us for information on the application of these new drill bushings to your problem.

HEX-A-GRIP
Positive Grip (Pat. Pending)

FOR IMBEDMENT IN CASTABLE MATERIALS



merican's Deltagrip drill jig bushings n't slip or rotate in the material cast ound them. They are made especially r use in castable materials such as rromatrix, Plastic, etc. Because of their sign with the FOUR-WAY DIAMOND RIP, Deltagrip drill bushings withstand e torque and thrust of the tool — they on't spin out. Save time, save money stop costly shut downs; get Deltagrip rill bushings now!

Also made for use in castable materials, the Hexagrip design keeps them from raising, lowering or spinning. They stay put! Save on costly drill jigs — use Hexagrip, Deltagrip or Serragrip drill jig bushings.

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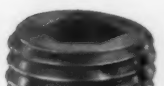
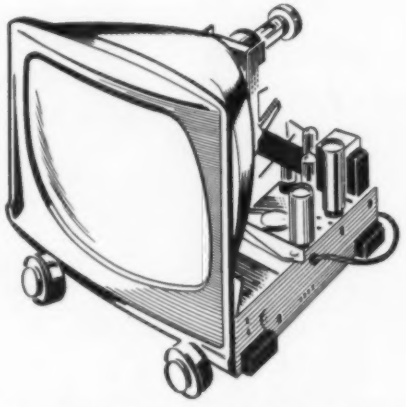


Our Fiftieth Year : A START FOR THE FUTURE

UNBRAKO SELF-LOCKING SOCKET SET SCREWS feature the following advantages: knurled cup point that won't work loose; accurate hex socket for nonslip, positive drive; fully formed threads—Class 3 fit; heat treated alloy steel for strength; standard sizes—#4 to 1"—in a full range of lengths.



USE UNBRAKO SELF-LOCKING SOCKET SET SCREWS wherever ordinary cup point set screws are used... on radios, television sets and electronic equipment.

On refrigerators, washers, other household appliances

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9 times out of 10 a standard UNBRAKO will do the job

A special socket screw may not be necessary, a standard UNBRAKO usually does the same job—much cheaper. Your local industrial distributor stocks Standards. He gives immediate attention to your requirements, and such extras as special delivery to your plant. Write for a copy of UNBRAKO Standards. SPS, Jenkintown 37, Pa.

UNBRAKO® SOCKET SCREW DIVISION

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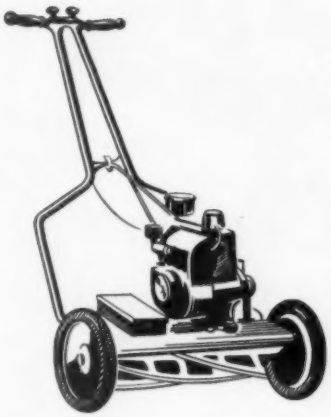

On power mowers, power saws and other power tools.

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A NEW
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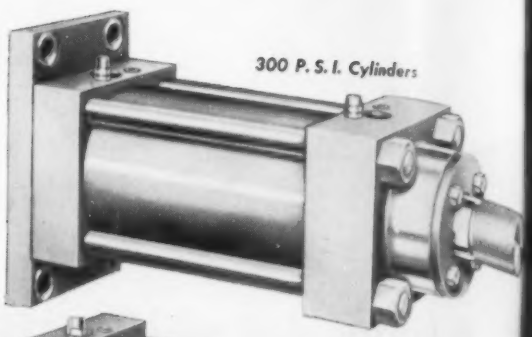
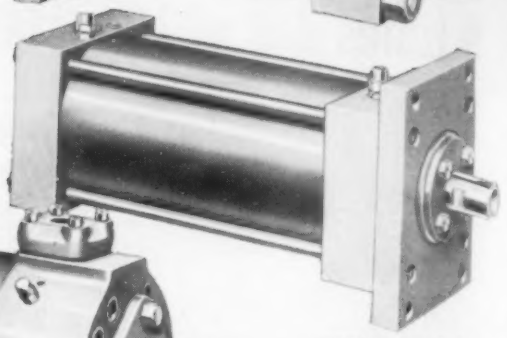
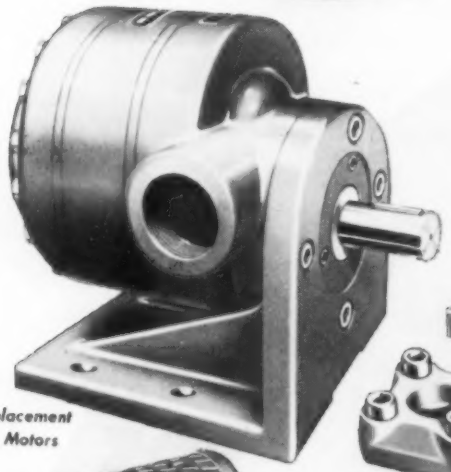
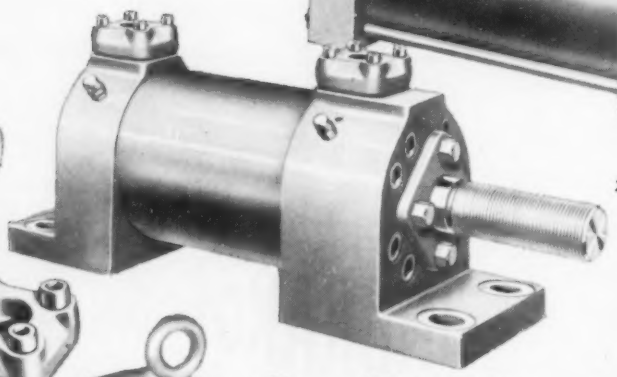
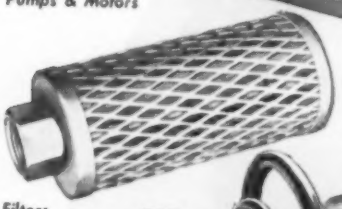


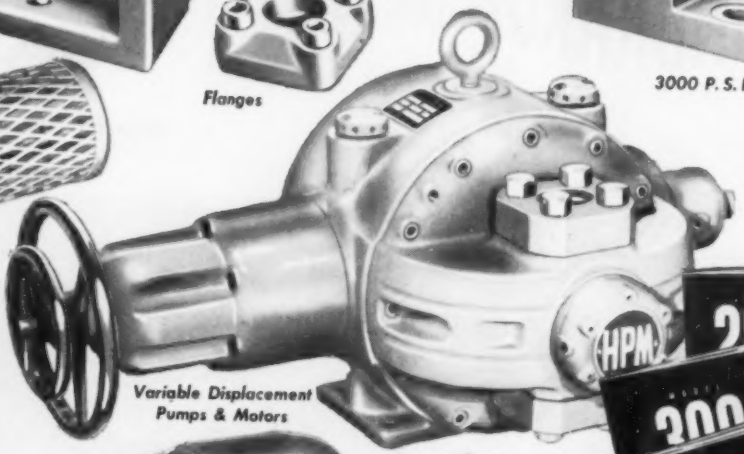



Fixed Displacement Pumps & Motors


3000 P. S. I. Cylinders

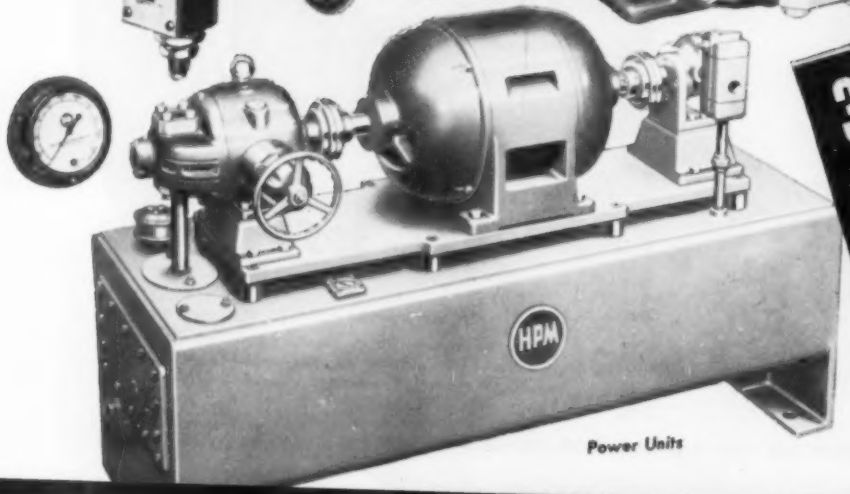
Flanges


Filters



Variable Displacement Pumps & Motors

Gauges



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OMPLETE LINE OF OMPONENTS

4-Way Flanged Valves

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Threaded, Flange and Gasket Mounted Functional Valves

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■ **CYLINDERS** — Over 800 basic models — 1½" to 12" bore sizes — 150 P.S.I. air or 300, 2000 or 3000 P.S.I. oil hydraulic service — Wide choice of standard mountings — Available with male or female, standard or 2:1, single or double end piston rods — Adjustable stroke — With or without cushion and with many combinations of mountings — Single acting, collapsible or telescoping, large bore and other special cylinders to meet unusual requirements.

■ **DIRECTIONAL VALVES** — 4-way and 2-way threaded valves, ¼" to 1½" in size for 2000 P.S.I. service — Manual, cam, foot, solenoid, oil and air pilot operation — Six spool styles — Stem, knob, lever and a new quadrant type control — Same models, types of operation and sizes also available with flange connections for 3000 P.S.I. — An equally complete line of gasket mounted valves, ½" to 4", 2000 and 3000 P.S.I. — Also rotary pilot valves — Over 3175 models with modern, improved styling for a maximum of service.

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■ **POWER UNITS** — Reservoir capacities 7 to 200 gallons — Fixed displacement or variable displacement pumps or combinations thereof — Modern design — Completely self-contained — Easy to clean — Compact — For every circuit requirement.

■ **ACCESSORIES** — To complete the circuit—filters, gauges, pressure switches, welding flanges, heat exchangers, slip joints and other equipment.

ONE source for your hydraulic circuit requirements! H-P-M makes circuit planning, specifying and purchasing easier . . . and assures undivided responsibility to the user.

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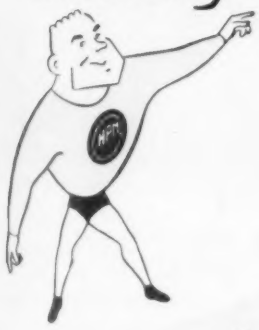

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Please send me the New H-P-M Component Catalogs checked below:

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- ☐ #801—Valves—2000 P.S.I. Threaded
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- ☐ #841—Valves—3000 P.S.I. Gasket
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HPM — HYDRAULIC POWER DIVISION

HYDRAULIC POWER DIVISION

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COMPARATOR MASTER MICROMETER GO-NO GO GAGE 1" RANGE IN 10000ths-NO GAGE BLOCKS NEEDED

* HUMAN ERRORS THROUGH DIFFERENCES OF "FEEL" ELIMINATED. WILL DETECT OUT-OF-ROUNDNESS, OVALNESS AND TAPER.

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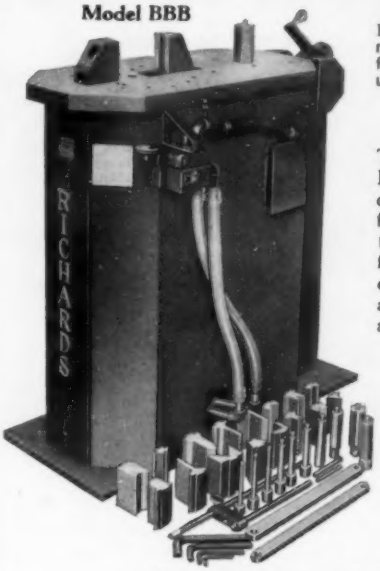
BIG BROTHER BENDER

Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses

Model BBB



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender, using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra. Will punch holes up to 1" and form material up to ½" thick by 4" wide. We also build smaller hand or air operated models for forming up to 1/16"x1¼" material.

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ALL THE DATA YOU NEED...

on DRILL JIG BUSHINGS

...at the flip of a single page

Make drill jig designing easier with this "Flip-a-page" catalog. Free on Request

COLONIAL BUSHINGS INC.

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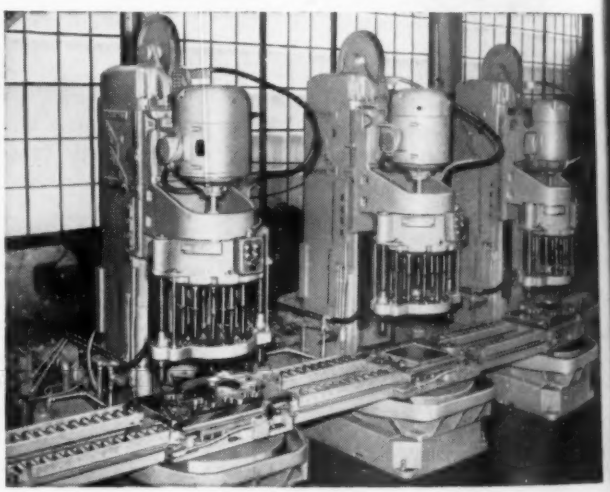

Standard No. S.O. 4132

A 3-column hydraulic drilling, counter-boring, and taper reaming machine equipped with three-25 H.P. STANDARD DRILL-MASTERS.

Attached to each column is a 14-spindle head with tooling to suit successive operations. Fixtures move from station to station on a roller conveyor.

Designed to drill, counterbore, and taper ream holes in sprockets.

STANDARD MACHINE AND TOOL CO., LTD. WINDSOR, ONT.

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KAUFMAN

RING

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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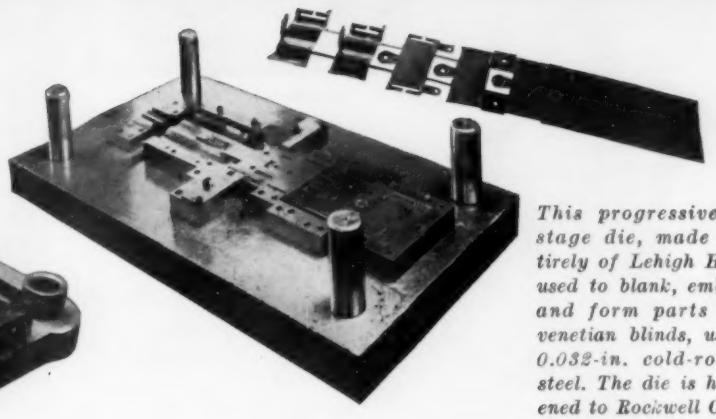
knobs are blanked and drawn from 0.035-in. steel or on this Lehigh H progressive die. Before Lehigh H used, the die was redressed almost daily. Now, in addition to providing a better surface on the knobs, die requires redressing only every sixth week.



This progressive 7-stage die, made entirely of Lehigh H, is used to blank, emboss and form parts for venetian blinds, using 0.032-in. cold-rolled steel. The die is hardened to Rockwell C-61.

THREE HIGH-PRODUCTION DIES MADE OF LEHIGH H

Lehigh H is a high-carbon, high-chromium tool steel with characteristics that make it ideal for high-production dies for long-run jobs. Here are the reasons why toolmakers have used it over so many years, with excellent results:

1. Maximum Wear Resistance. Because of its high carbon-chromium content, Lehigh H puts up good resistance to wear. It is the most economical steel for long runs.

2. Close Tolerances. Lehigh H is an air-hardening steel, with only minimum distortion during heat-treatment.

3. Safe Hardening. It is cooled in still air from a hardening temperature of 1850 F, and minimizes the cracking hazards of intricate dies, thin sections, and insufficient radii.

4. Severe Service. Lehigh H is a deep-hardening steel, even in large sections, and has high compressive strength.

When three die rings were needed for high-production blanking of covers for large drums for shipping carbide, the manufacturer specified that each ring be held to close tolerances, and after hardening have a Rockwell-C hardness of 61 to 63. The rings were made from Lehigh H. Each was given a C-scale Rockwell test at four points, with these results: Ring 1: 61, 62, 61, 61; Ring 2: 62, 62, 63, 62; Ring 3: 62, 62, 61, 61.

eeling Off Ribbons

is chip is curling off the tread of a -in. railroad car wheel. The tire-form-g tool, nearly hidden at the left, is ade of Bethlehem 66 High-Speed Steel, d is used for both roughing and finish-g. On untreated wheels these tools av-age about 45 wheels before regrinding necessary; on heat-treated wheels, they erage 16 per grind.

66HS is ideal for a wide variety of tting tools. It's our M2 grade, contain-g 6 pct tungsten, 5 pct molybdenum, pct chromium and 2 pct vanadium.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Improper Tool Clearance Reduces Tool Life

In operations such as punching and blanking, the service life of the tool is largely dependent upon the tool clearance. For example, many punch-and-die sets are made up with a "standard" clearance. But as the proper clearance for punching soft steel is approximately one-tenth of the stock thickness, it is evident that the "standard" clearances are correct for only one stock thickness.

The ideal tool clearance produces flat, sharp punchings with minimum tool load. Excessive clearance produces deformed and burred punchings, and requires high tool loads which shorten tool life. Though insufficient clearance produces flat, sharp punchings, it also requires excessive tool load, and should therefore be avoided. Besides, it increases the danger of damaging the tools because of misalignment.

KAUFMAN TAPPING MACHINES

BUILT FOR SPECIFIC PRODUCTION JOBS

THE MODEL A
KAUFMAN TAPPER

Kaufman has specialized for many years in the building of tapping machines. Every machine is precision-built to meet the requirements of individual production jobs. Built with fully automatic cycle, single or multiple spindle heads and other most advanced features.

Send prints and sample of your work for further information and recommendations on how Kaufman Tapping Machines can reduce your production costs.

Catalog Number 1153
Mailed on Request

KAUFMAN
MANUFACTURING COMPANY
553 South 29th Street
Manitowoc • Wisconsin

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INCREASE PRODUCTION.. SAVE TIME & MONEY

ON YOUR DRILLING OPERATIONS

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MEYCO

Carbide Inserted Bushings last longer, cost less in the long run

Here is a bushing that combines the best features of steel and carbide; the strength of steel and the long life of carbide. First cost: slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on nonproductive man-hours.

☆

Auto manufacturer says: "... the steel bushings previously used averaged about 28 hours life. MEYCO bushings ran 1,168 hours before they were unusable."

For information and prices write for Meyco Bushing Catalog No. 13

W. F. MEYERS CO., INC., BEDFORD, INDIANA

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RING PUNCHES

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HARD...
tough...
concentric...

Precision-made of both Carbon Vanadium and high carbon, high chrome steels. Available in a wide range of stock sizes from 1/32" to 1" point diameters in increments of 1/64" for immediate delivery. Decimal sizes to order for delivery within 48 hrs.

Button Dies

Ring Type or Press Fit

Hole tapered to eliminate slug jamming. Sizes in stock to match punch sizes.

Write TODAY for your copy of handy data sheets covering specifications and prices; also name of distributor in your area.

Exclusive distributor wanted for the states of Washington and Texas.

Ring Punch & Die Co.

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GROBET CHATTERLESS COUNTERSINKS

They are terrifically popular because the six staggered cutting edges are scientifically designed to give a shearing cut and thus eliminate all chatter.
Made in 12 sizes in all degrees; also supplied as sets in strong Kit-cases.

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421 CANAL STREET, NEW YORK 13, N. Y.

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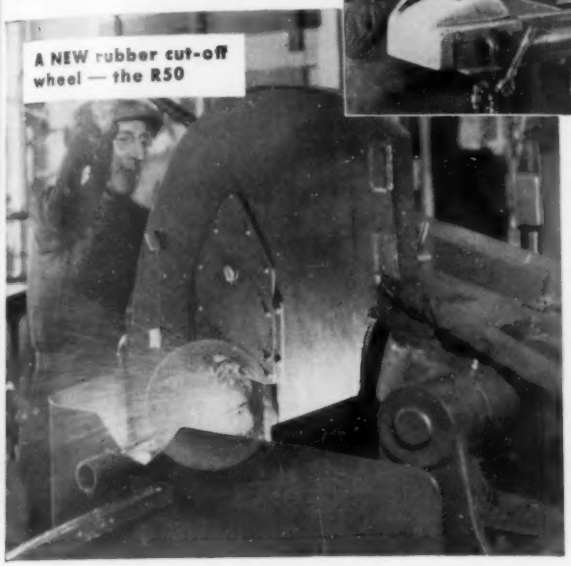
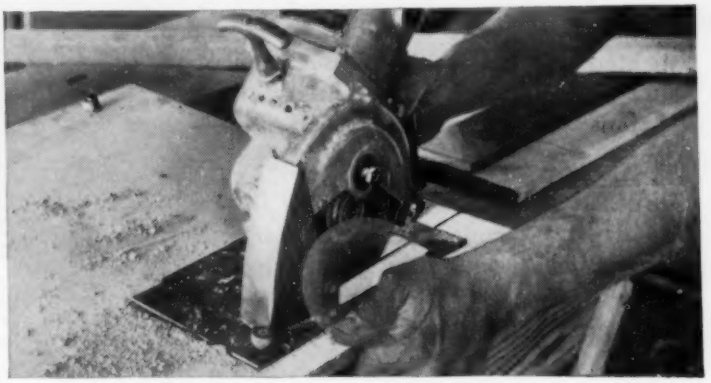
For high production — The new Norton B9 resinoid bonded cut-off wheel cuts free and cool at speeds up to 16,000 surface feet per minute. An exceptional performer on both ferrous and non-ferrous metals. ▶



Where clearance counts — The new Norton R50 rubber bonded cut-off wheel, has the unusual advantage of built-in chip clearance. Ideal for wet-cutting of ferrous or non-ferrous bar stock, in diameters up to 6". ◀



Stronger, safer, more versatile — The popular Norton BN cut-off wheel, resinoid bonded, is used on all types of machines for the widest variety of metallic and non-metallic applications. ▶

Cost-cutters for cutting-off!

Norton wheels bring the

"TOUCH of GOLD"

to every job

Each type of cut-off wheel in the broad Norton line has individual features for top efficiency and economy in its particular job range. For example:

The new Norton B9 resinoid bonded cut-off wheel is made with either smooth sides or the rougher "F" sides for more clearance. A high production wheel, the B9 cuts free and cool, with a minimum of burning and will give you long, money-saving service in the widest range of metal-cutting applications.

The new Norton R50 cut-off wheel, rubber bonded, is designed especially for wet-cutting of bar stock up to 6" diameter. Built-in chip clearance is an advantage that helps assure freer, faster cutting with maximum service life.

Long a great favorite for metallic and non-metallic cut-off jobs, the resinoid bonded BN wheel features versatility and safety. On all types of machines — on jobs ranging from cutting tile to track slotting — the BN delivers up to six times longer wheel life, with breakage practically eliminated.

Other outstanding Norton cut-off wheels: the resinoid bonded B2, a valuable tool room wheel and also widely used on non-metallic materials; the rubber bonded R30 for small diameter work and fine slotting; and the highly durable, rubber bonded R20 that resists severest dressing action.

Ask your Norton distributor about the correct Norton cut-off wheels, in ALUNDUM* abrasive or CRYSTOLON* abrasive, for your materials and machines. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

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ABRASIVES

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We've put a new roof over an old part of our business

Now—with new, expanded facilities—we can offer you immediate help with your unusual metalworking problems, big or small

THOUGH we've been designing and building standard and special machine tools and tooling since 1898, limited production facilities for special machines have prevented us from offering these services on a wide scale.

But now, our Special Machinery Division has new and greatly expanded facilities. Its exclusive job will be to build special machine tools and tooling or to specially adapt standard equipment to solve specific metalworking problems.

Check our qualifications:

EXPERIENCE: We've been in the business 55 years. In addition to being one of the country's leading producers of standard milling machines . . . *our annual production of special machinery has ranged up to $3,000,000.*

FACILITIES: The new Special Machinery Division plant, built on a 38-acre site, is equipped with more than *$2,500,000 worth of new tools and equipment.*

PERSONNEL: The Special Machinery Division engineering section has nearly 100 experienced design and production engineers at its command. These men specialize in applying the latest developments in mechanics, hydraulics, electronics, metallurgy and allied fields to metalworking. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

PERFORMANCE: Kearney & Trecker's Special Machinery Division is best recommended by its record of successfully solving hundreds of unusual machining problems. These solutions required provision of high productive capacity as well as exacting dimensional accuracies and surface finishes.

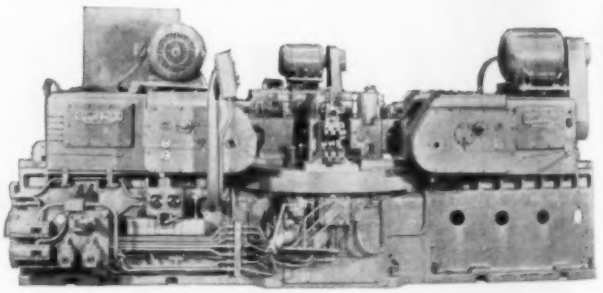
RESPONSIBILITY: Our Special Machinery Division is an integral part of the Kearney & Trecker Corporation . . . and is fully supported by all its financial, physical and personnel resources.

Any commitment for a product of this Division is a commitment that fully involves the accepted reputation for responsibility and satisfaction that is Kearney & Trecker's.

We invite your inquiry

We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



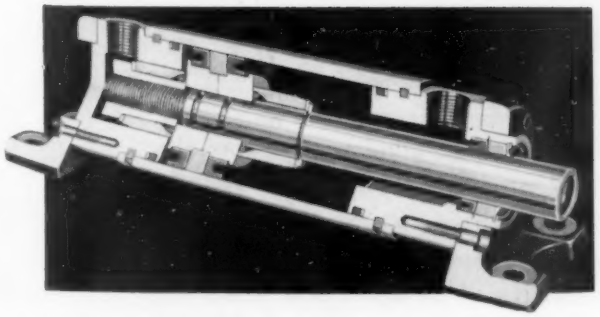
We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a four-station rotary indexing machine we designed and built for a major automotive manufacturer.

Solve

straight-line motion problems

elevating
lowering
pushing
pulling
tilting
clamping
opening
closing
knock-out operations

with O-M CYLINDERS (air · hydraulic)

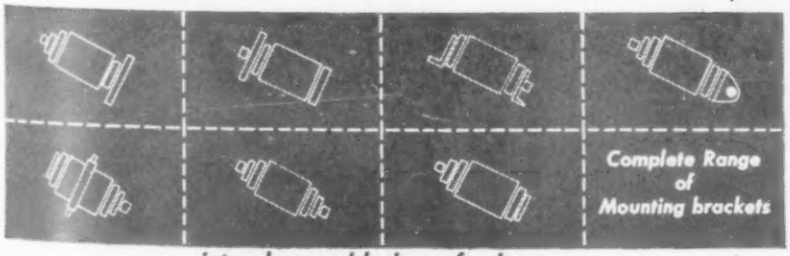


Write today for FREE catalog and complete set of ½ and ¼-scale templates showing all cylinders and mounting brackets.

14 day delivery on most sizes

From a smooth, delicate push on a testing machine to a rugged thrust on a press application, O-M Cylinders handle all straight-line motion problems with ease and precision. *Special interlocking mechanism* eliminates needless tie rod · end caps . . . saves 1/3 INSTALLATION SPACE. Also assures better alignment, gives O-M the lowest coefficient of friction of *any* cylinder . . . smoother performance at low or high pressure regardless of length of stroke. End plugs tapped for universal mounting. Any one or combination of mounting brackets may be used to install . . . *without disassembling or changing cylinder.* Easily removed, inspected, repaired.

Available in a full range of sizes (1½″ to 8″ bores) with standard, 2 to 1 or oversize rods. All machined steel with bearing bronze, no castings. Completely interchangeable parts.



interchangeable bore for bore

ORTMAN-MILLER MACHINE CO.
1216 150th Street, Hammond, Ind.

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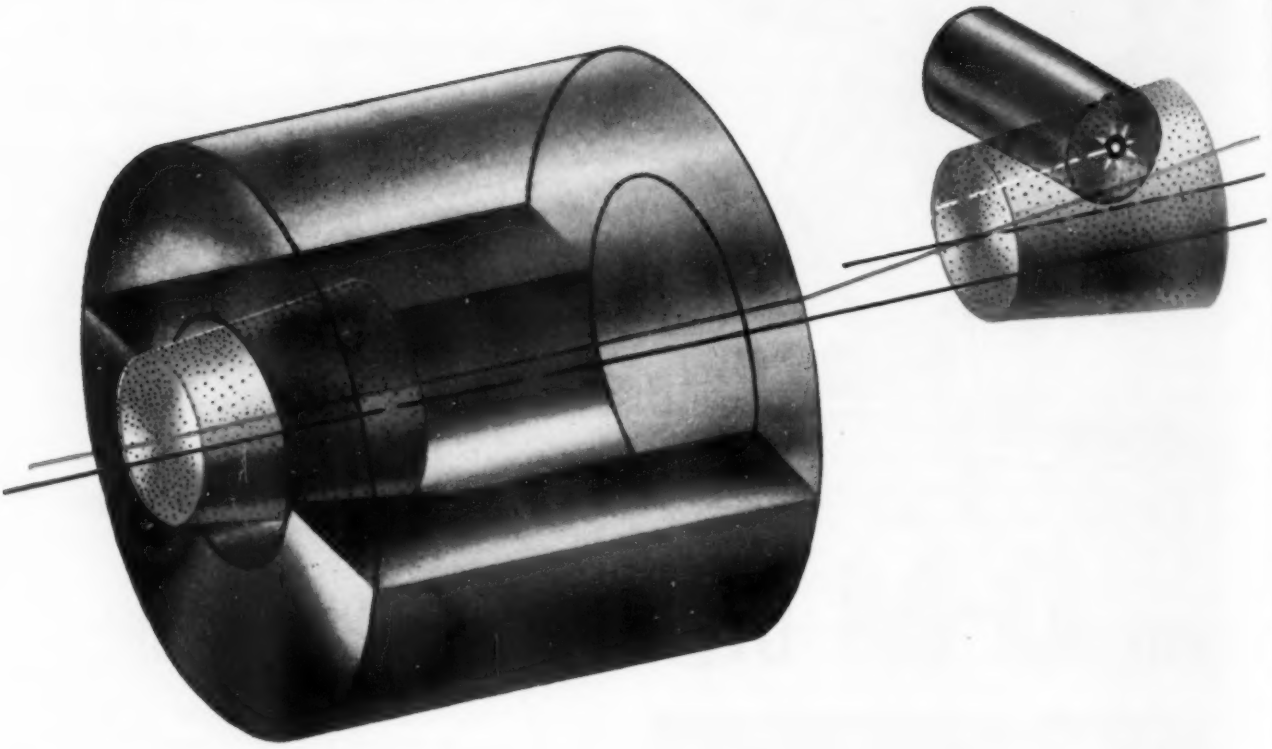
alignment

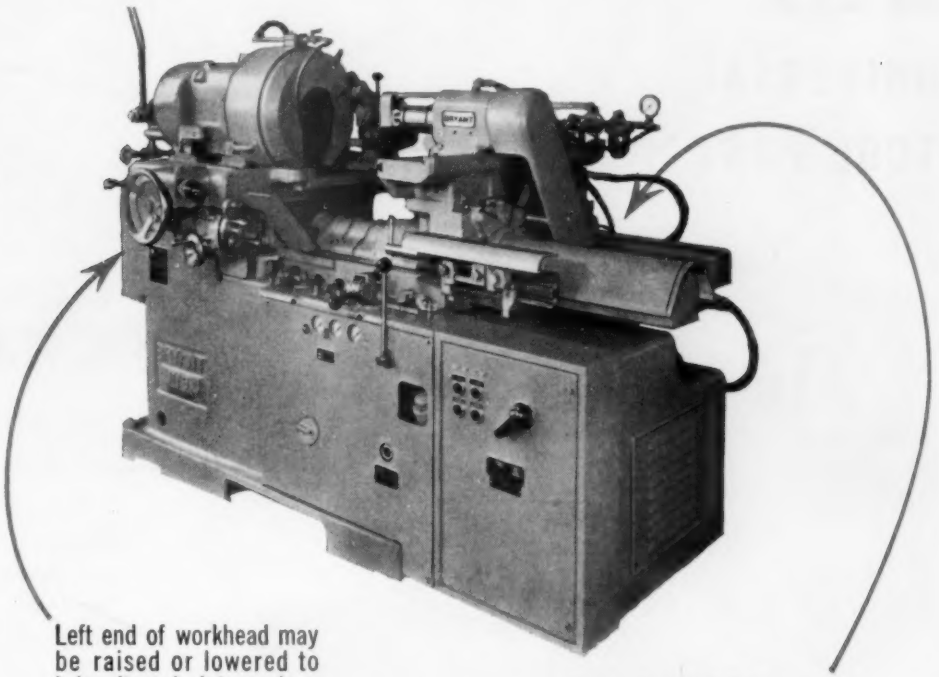
for better internal grinding



IT is common assumption in internal grinding that once the grinding wheel passes the diamond, all errors will be eliminated and the wheel will be a perfect cylinder. It is also assumed that this grinding wheel can produce a straight hole. These two assumptions are true if the wheel path is a straight line parallel with the axis of the wheel as it passes the diamond and traverses the work.

In the illustration, the wheel slides are badly worn and the wheel path is not a straight line. The distortion in the ways causes the wheel to move gradually away from the diamond and the wheel is dressed to a taper as it passes the diamond. Then, as the tapered wheel traverses the work, it will grind only on its large diameter. At the point of reversal the tapered form will be transferred to the work. If the traverse stroke is lengthened, the tapered section will be moved to the new point of reversal. In addition, wheel wear will be excessive, finish will be poor, feed lines may be visible.

Available information advises simply turning the workhead or changing the length of traverse to correct taper. In the case illustrated, neither turning the workhead nor changing the length of traverse will produce a straight hole. The only possible remedy is to straighten the wheel slide ways which will, in turn, straighten the wheel path. The wheel will then contact the work properly, producing correct geometry of the hole, longer wheel life and better finish.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This machine is for general purpose hole grinding. It has convenient centralized controls and all features necessary to handle a variety of work with minimum time and effort needed for changing jobs. For stable 3-point support, the wheel spindle is mounted on a cylindrical bar which is supported on 2 cylindrical bearings. The rear of the slide is supported on a hardened and ground guide plate. Workhead may be swiveled for grinding tapers up to 90° included angle. Provision is made for mounting a face grinding spindle in addition to the hole grinding spindle. The No. 1116 will swing 16″ with 12″ max. hole depth. Write for folder.

Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

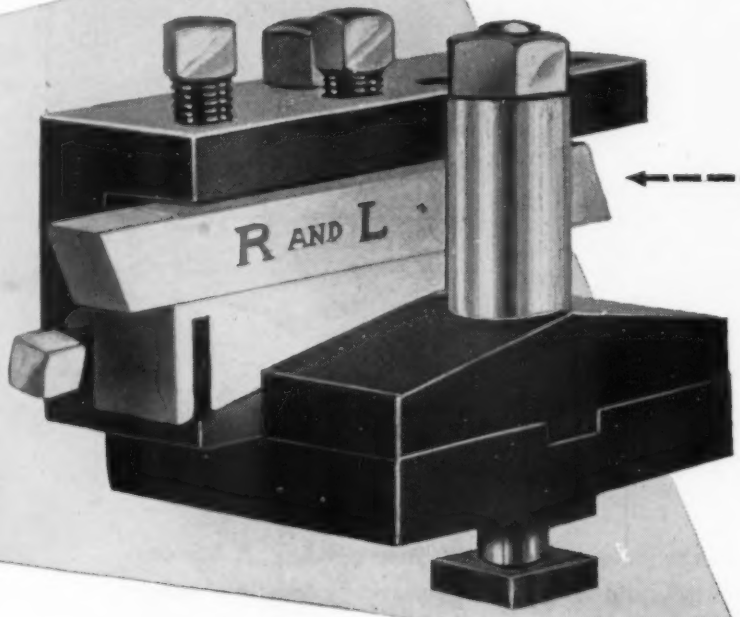
Bryant Chucking Grinder Company

Springfield, Vermont, U. S. A.

Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Boring Machines

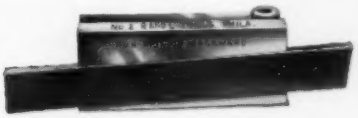
DOUBLE Duty

R and L UNIVERSAL TOOL POST



specially designed

The R and L Cut Off Blade Holders are precision made to flawlessly fit in the Universal Tool Post.



More than just a tool post! The R and L Universal Tool Post is made by men who completely understand your shop problems. Precision manufactured to hold square or flat tools, providing the means for adjusting the tool in all directions. Can be used close to the chuck, on front or back cross-slide with spindle running forward or backward.

Write today for the new R and L Catalog

RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • TAP AND DIE HOLDER • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL KNURLING TOOL • CARBIDE AND ROLLER BACKRESTS • RELEASING ACORN DIE HOLDER • REVOLVING STOCK STOP • FLOATING DRILL HOLDER

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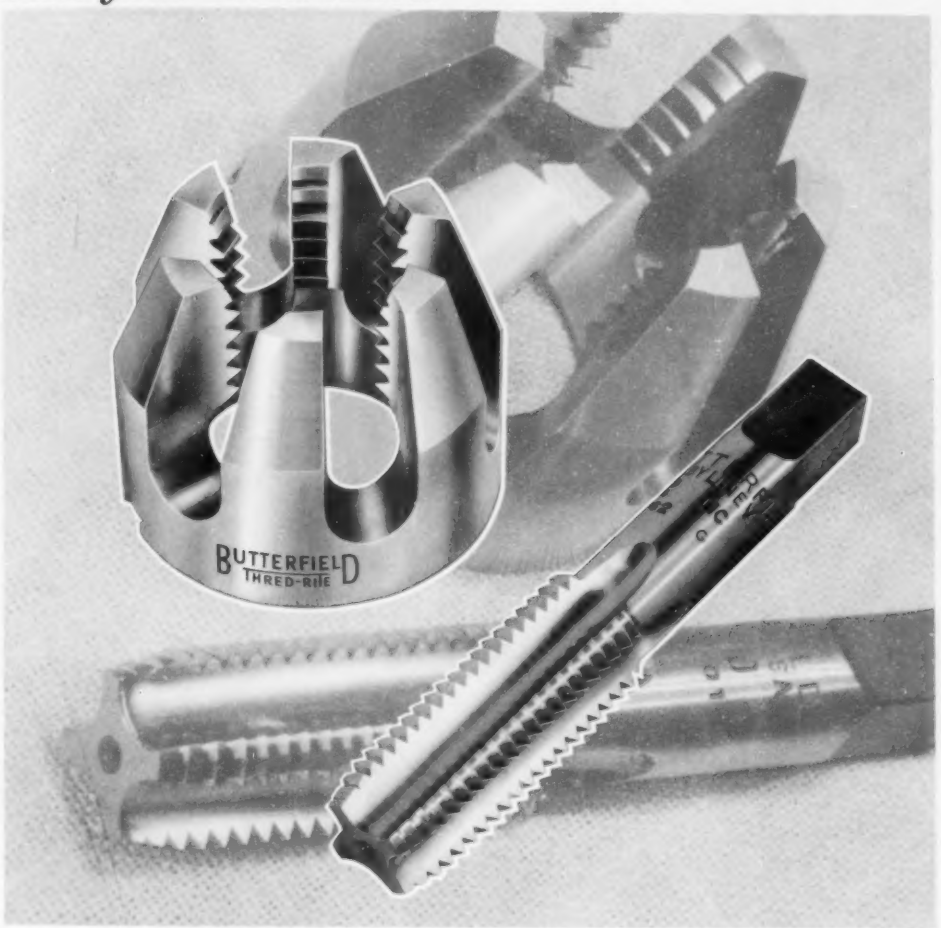

Photograph by Paul Davis

Part of Butterfield's fine reputation for taps and dies stems from rigid control over quality production. The value shows up in performance.

BUTTERFIELD

Union Twist Drill Company ***Butterfield Division*** *Derby Line, Vermont, U. S. A.*

TAPS • DIES • REAMERS • DRILLS • COUNTERBORES • SCREW PLATES

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OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
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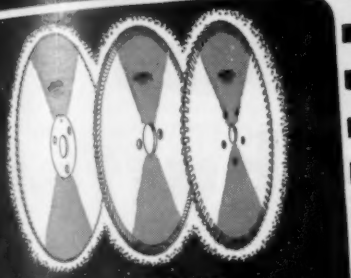
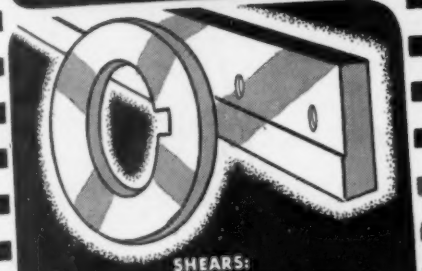
CUT INVENTORY COSTS—ORDER FROM YOUR LOCAL UNION DISTRIBUTOR

Here's a "Short" of SIMONDS Metal-Cutting Line



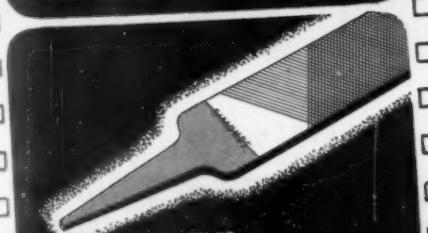
CIRCULAR SAWS:
Most complete line of types and sizes . . . Solid, Segmental, Inserted-Tooth, Carbide-Tipped, for cutting any type of metal faster, smoother, straighter.

BAND SAWS:
Regular Hard-Edge Band Saws, also Skip-Tooth Hard Edge, and Spring-Temper Band Saws . . . all 3 run more easily.



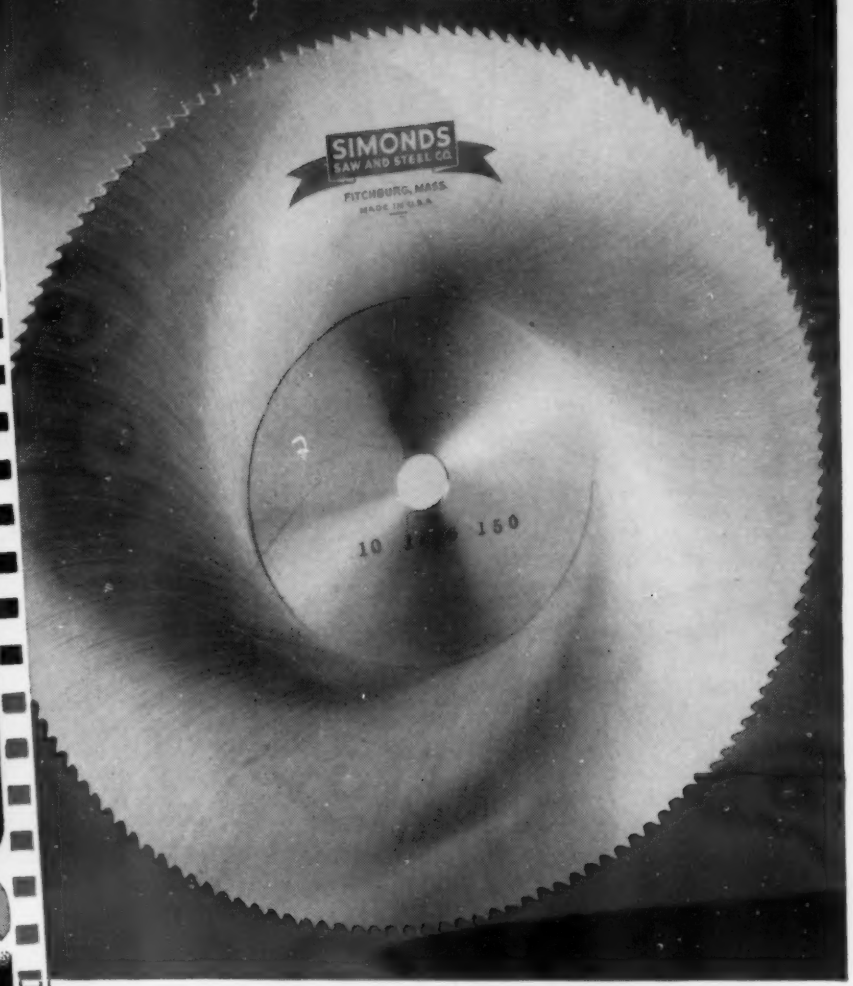
SHEARS:
"Red Streak" Rotary Shear Knives for clean cutting of strip or sheet. . . . "Tungs-weld" Squaring Shears give you sharp savings in cutting thin metal.

HACKSAW BLADES:
Famous "Red End" Blades for hand or power cutting . . . for top money's worth on any hacksaw job.



FILES:
Only Simonds "Red Tang" has the teeth like a metal-cutting saw . . . teeth that remove more metal with less effort.

TOPS for ALL NON-FERROUS CUTTING



On all non-ferrous metals, here's the toughest, most "stand-up-and-take-it" saw made . . . with a proven production record on everything from light-wall sections to solids.

SIMONDS heat-treats these saws for individual applications, according to speed, type of material, and machine. And SIMONDS design assures top cutting efficiency . . . with correct tooth-shape that eliminates clogging of gullets . . . with high, smooth finish that resists adherence of chips to plate . . . and with proper clearance for freer, cooler, straighter cutting.

Standard sizes are immediately available from stock . . . so see your Simonds Distributor *today*.

SIMONDS
SAW AND STEEL CO.
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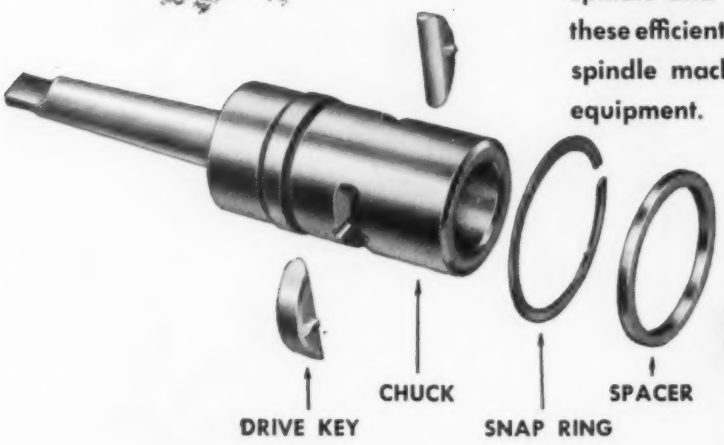
Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que. Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

IT COSTS YOU MONEY.....

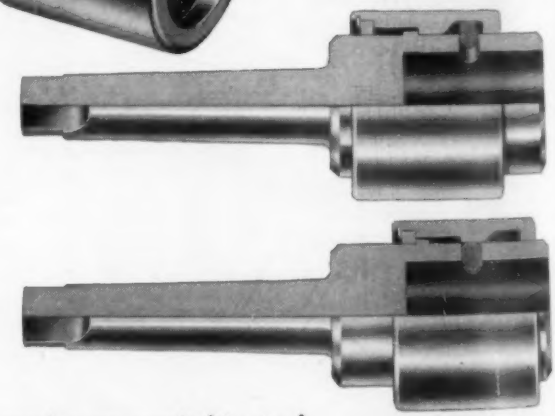
to press this button!

Beaver PRECISION RAPID DRILL CHUCKS AND COLLETS ELIMINATE COSTLY DOWN-TIME!

You can change Beaver Precision Collets in Beaver Precision Rapid Drill Chucks without stopping the machine spindle and with absolute safety to the operator. With these efficient, sturdy, economical Beaver Tools your single spindle machine will do the work of multiple spindle equipment.



The three views show the construction of the Beaver Precision Collet (above), and the design of the Beaver Precision Rapid Drill Chuck (below).



In Beaver Precision Rapid Drill Chucks, the collets are locked securely and driven by hardened steel drive keys extending entirely across both sides of the collet. All parts are hardened and ground to take maximum loads on high-powered, modern machines. They're precision-built for alignment, concentricity, and overall accuracy. Use Beaver Tools—test their superiority for yourself.

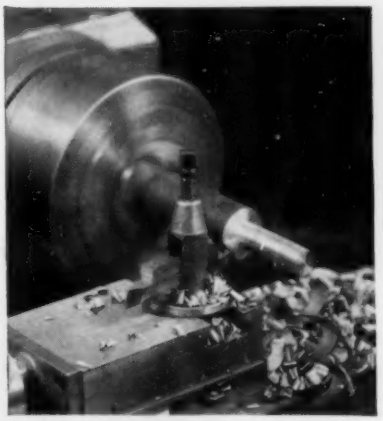
Beaver Standard Machine Tool Accessories are carried in stock.

Beaver TOOL AND ENGINEERING CORPORATION

BOX 429, ROYAL OAK, MICH., Teletype - Big Beaver 648

VERSATILE 12" SWING LOGAN LATHE

FOR PRODUCTION, TOOL ROOM, MAINTENANCE, SCHOOL SHOP



SMOOTH
On Heavy Cuts

With smooth power this 12" Logan hogs out a .375" cut from bar stock. Extra weight in the headstock . . . a massively proportioned spindle turning on oversize ball bearings assure the rigidity and sustained accuracy that makes heavy cuts easy.

In versatility, accuracy and value, this 12" Logan Lathe is *new*. Wide speed range, sustained accuracy, and rigidity on heavy cuts are inherent in its massively proportioned ball bearing spindle construction. Its heavy headstock, double V-belt drive, and heavy-ribbed bed with two V-ways and two flat ways precision ground to within .0005", mean lasting accuracy on production lines. The completely machined saddle and large, accurate dials are typical of the features which adapt it to exacting tool room work. With 1" collet capacity, 1⅜" spindle hole, and either 23" or 35" center distances, the 12" Logan has the size to meet most shop requirements. Simple and safe to operate, it is well adapted to student training. In brief, this 12" Logan can put new efficiency and more profit in your lathe turning operations.

ECONOMY
In Production

Typical parts made on Logan Lathes and held to closest tolerances at minimum cost per finished part. Rugged, accurate Logan construction keeps production lines going at top efficiency.

SEE IT AT YOUR LOGAN LATHE DEALER'S, OR

Write for Information . . .

Full catalog descriptions and price information on request.

Write today to

Logan
ENGINEERING CO.
Lawrence and Lamon Avenues
Chicago 30, Illinois

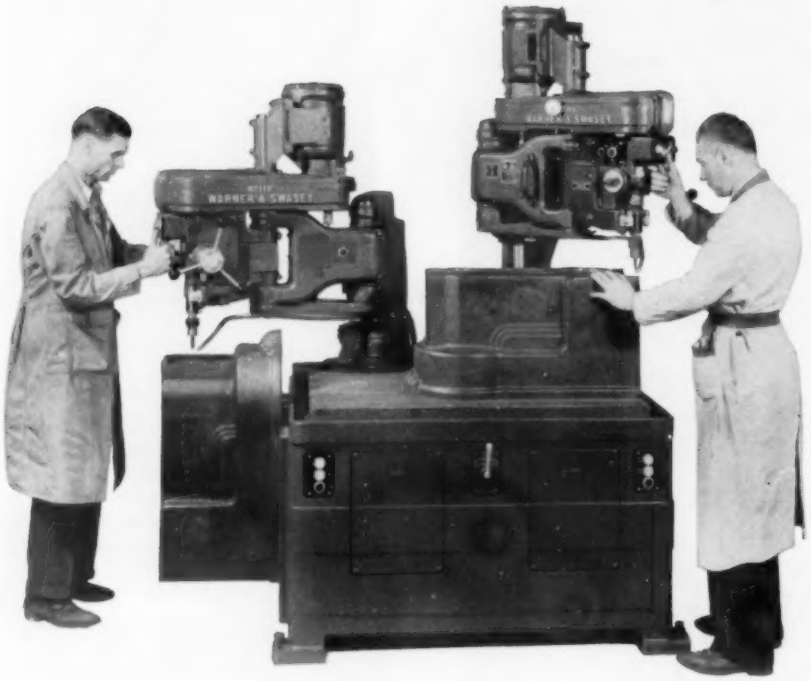
Brief Specifications

Swing over bed and saddle wings, 12" . . . Center Distances, 23" and 35" . . . Turret Lathes Models have 43" bed length . . . 1⅛" spindle hole . . . 1" collet capacity . . . 16 V-belt drive spindle speeds, 35 to 1230 rpm. . . . Variable speed drive, infinite spindle speeds, 38 to 1575 rpm.

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INIDICATE A-11-193

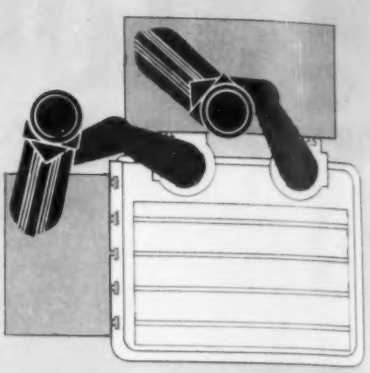
NOW–PRECISION TAPPING FOR LARGE, BULKY PARTS!



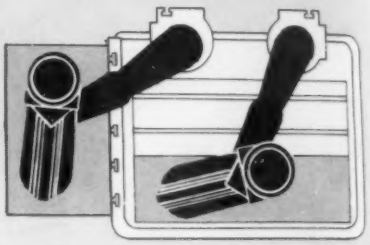
Warner & Swasey No. 11R Radial Tapping and Threading Machine. Available with single or dual, independently-operated, tapping heads.

EXTREME VERSATILITY plus the positive threading accuracy of Warner & Swasey's exclusive lead-screw principle are combined in the No. 11R Precision Tapping and Threading Machine. Here's one machine that handles Class 3 and 4 tapping on a production scale—in a wide range of materials—on bulky parts as well as smaller ones. Tapping heads swing to the work—push button control raises and lowers columns. It's simple to set up and operate—a machine you can count on to reduce scrap loss, cut costs.

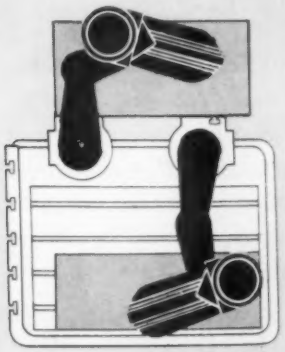
THREE CONVENIENT WORK SURFACES, AND TWO COMPLETELY INDEPENDENT TAPPING HEADS, MAKE MANY COMBINATIONS POSSIBLE ON THE NO. 11R DUAL RADIAL.



Extra long work pieces can be let into pits at rear and left end of machine.



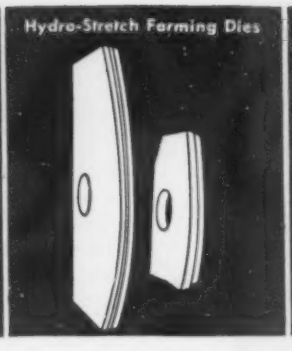
One piece can be mounted on left end, another on top of base — or both on top.



Rear vertical work surface and top of base can be used at same time.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY



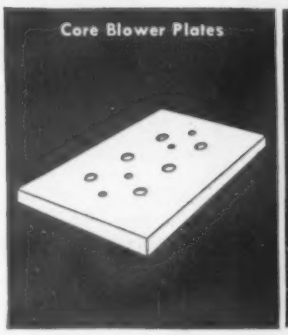
LOWER YOUR COSTS for TOOLS, DIES & FIXTURES

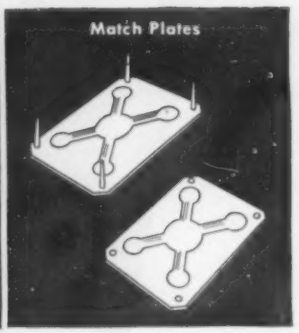
with REYNOLDS ALUMINUM CAST PLATE & BAR

Your low production and experimental runs no longer need to be a problem. Tools, dies and fixtures made from Reynolds Aluminum cast and machined plate and bar will give you high dimensional stability, better performance and longer production life than other low cost stock. The outstanding features of this revolutionary material include fine grain structure; precision surfaces; light weight; low cost; fast, free machining; good weldability; excellent thermal characteristics and a wide range of popular standard sizes.

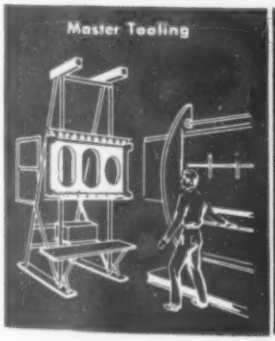
First proved superior in the aircraft industry, cast aluminum plate and bar has simplified production problems in many industries. No other material can match its advantages at so low a cost.

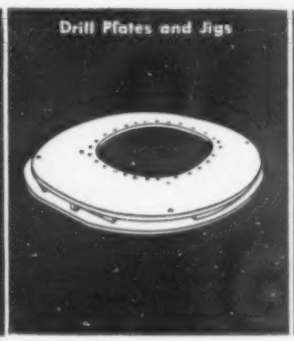
For full details on Reynolds Aluminum Cast Plate and Bar, call your nearby Reynolds office listed under "Aluminum" in the classified telephone directory, or write Reynolds Metals Company, 2525 South Third Street, Louisville 1, Kentucky.





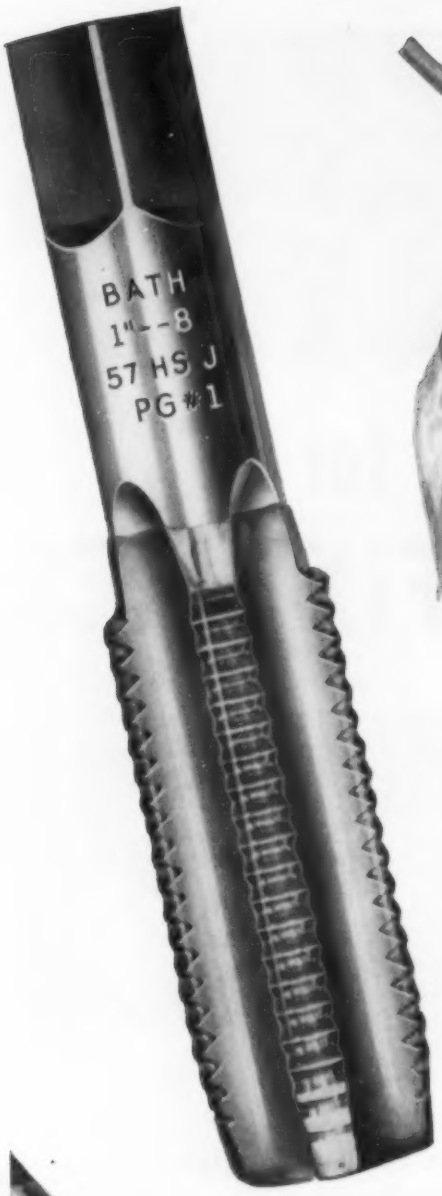
Write for free brochure, "Reynolds Aluminum Cast Plate and Bar for Machine Shops, Foundries and Pattern Shops."





REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND



Removing the protective seal from Bath Taps is like peeling the skin of a banana!

The cocoon — Nature's perfect seal — is moisture proof . . . guards against attack.

SEALED-IN PROTECTION

You can always be sure that Bath Taps come out of the stockroom FACTORY FRESH! No chance of damage during shipment, handling or storage — because a special protective plastic skin forms a coating over the "business end".

This man-made cocoon, seals in all the original manufacturing craftsmanship and engineering precision of these fine tools — from factory to user. It's moisture proof, too — guards Bath Taps against attack by rust — protects sharpness and cutting efficiency.

Whether you leave them in "moth balls" for minutes or months — you'll find Bath Taps packaged for your protection in the most modern way — a mighty important extra service.

If you do not already know him — we'll be glad to put you in touch with a Bath representative nearby, who will help you with your threading problems.

Insist on BATH TAPS for BETTER THREADS

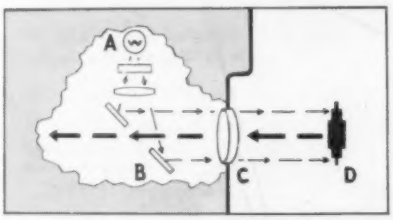
JOHN BATH & CO., Inc.
28 Grafton St., Worcester, Mass.

PLUG AND RING THREAD GAGES GROUND THREAD TAPS INTERNAL MICROMETERS

Plain Pointers on Projection

ONE of the basic precepts of the study of geometrical optics is that the angle of incidence equals the angle of reflection. This law, recognized by the Greek philosophers and refined by later investigators, has an important bearing on modern optical gaging by projection. In numerous instances it is desirable to project the surface of a part on the screen to check the position and size of recesses or to measure features which may not permit conventional profile shadow images. The ease and success with which this is done depend not so much on how much light is thrown on the part as on how much of this light is reflected back into the instrument's lens.

Traditionally, surface illuminators used with contour projectors have been placed at an angle on each side of the lens or optical axis. This was true of the pilot model of the Kodak Contour Projector and we frankly admit it proved somewhat less than perfect. Since the light struck the part at an acute angle, it was reflected from the surface at a similar angle—reflected away from the lens, as it were, when the part was normal to the lens for a distortion-free image.



However, between design of this pilot model and our production models, our optical engineers devised a radically different system. As shown here schematically, this consists of a 1000-watt lamp (A) so mounted that its light is reflected by a mirror (B) through the front lens (C) of the instrument. Since the light from this surface illuminator travels along the axis of the lens, it is reflected from a part (D) back through the lens with negligible loss. By staging the part to be measured perpendicular to the optical axis, the angles of incidence and reflection approach zero degrees. Light is reflected from the part back on its own path.

This permits inspection of deep recesses and results in a screen image of unusual brilliance when projecting surfaces. The latter we have frequently demonstrated by placing the works of a small watch on our contour projector. Spectators are generally impressed to see the wheels and gears in motion, and on at least one occasion we've had a watch brought to us for repair. While this was perhaps somewhat embarassing, we're reconciled by the thought that users of our projectors are saved embarrassment daily because of the accuracy with which they can gage parts to "tenths."

Inspection costs fall when surface features and profiles are checked simultaneously

YOU may be missing a chance to lower inspection costs, speed the work, if you're overlooking the surface illumination feature of the Kodak Contour Projector.

Take the Geneva wheel shown here. By optical gaging, 47 dimensions are checked to tolerances of .001" in *less than 60 seconds,* using a single chart-gage and a simple staging fixture. Conventional shadow projection is used to check 36 of these. But only through surface projection can the 11 dimensions of the hub, including five angles and three radii, be checked simultaneously. A flick of a switch and the unique, self-contained surface illuminator (described in the column at the left) makes checking surface details as easy as measuring shadow profile.

The inherent speed and accuracy of inspection and measurement on Kodak Contour Projectors are lowering inspection costs on all sorts of parts, simple and complex, large and small. The field representative in your area will be glad to show you how optical gaging can work for you. To get in touch with him, or for a copy of a booklet, "Kodak Contour Projector," write to:

Special Products Sales Division
EASTMAN KODAK COMPANY
Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie, Optical Gaging, shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak
TRADE-MARK

Stamping output Up 400%
Output Up 192% On Lathe Turning
4 Holes Drilled 7 Times as Fast
Reaming Production Doubled
Bead Rolling Time Cut 50%
Milling Production Doubled
Production Increase In Surface Milling 300%
Hollow Milling and Drilling Production up 400%
40% Gain in Milling Production
Deep Hole Drilling Output Increased 350%
400% Production Gain in Drilling and Tapping
Output of Shell Molds Increased 815%
End Milling Time Cut 54%
Counterboring Production Jumped 133%

The key to every one of these production gains is a unique air cylinder whose basic cost was less than the operator's weekly pay check.

Every machining operation pictured here is being done on inexpensive, shop built, special purpose machines. Designed either by the companies' own engineers or by a Bellows Field Engineer, the machines were built from parts normally available in every tool room. But the heart of each machine — the thing that makes it tick — is one or more Bellows Air Motors — an air cylinder so different that it has sparked the creative imagination of tool engineers and production men in more than ten thousand plants.

This air cylinder, alone among all air cylinders made, combines the speed and flexibility of air, the sureness of electrical control, and, with the Bellows Hydro-Check control, the smoothness of hydraulics, all in one compact, packaged power unit.

Bellows Air Motors can be applied to hundreds of different standard machines to speed up feeding or ejection of parts; to feed tools faster, more accurately, safer; to permit relatively unskilled operators to turn out top quality work. They can be incorporated in special machines to perform any repetitive push, pull, lift or turn motion. The range of their usefulness is limited only by the ingenuity of the user.

813A

THIS NEW BOOKLET TELLS THE STORY

Write for it *Today!*

Here in this fast reading 36 page bulletin is the dramatic story of Bellows Air Motors and other Bellows "Controlled-Air-Power" Devices. Packed full of design information, case history data, photographs and diagrams — information every man concerned with costs and production should have. It is free on request. Write — Dept. TE1153, The Bellows Co., Akron 9, Ohio. In Canada, Bellows Pneumatic Devices of Canada, Ltd., Toronto.

The Bellows Co.
AKRON 9, OHIO

NOW!

ARNOLDAIR

brings new accuracy to the Arnold Grinding Gage

Smoother, clearer, precise, size indication

Now, the Federal Dimensionair has been adapted to the already well known Arnold Grinding Gage so that the latter gage becomes even more efficient. This device is original with Federal-Arnold Gages.

The Arnoldair attachment Model A-77 is a simple device attached to the Dial Indicator which makes it possible to read all size or dimensional changes on the Dimensionair. Because of the cushioning effect of air the Indicator Hand on the Dimensionair Dial follows the reduction in size of the workpiece smoothly without vibration or oscillation.

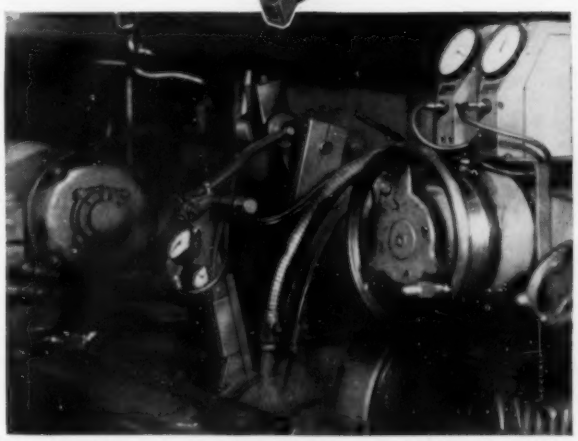
The operator watches the Dimensionair indicator hand come right up to specified size *smoothly* and *positively*.

In various plants where the Arnoldair has already been installed, enthusiastic reports say that practically every piece is now ground right to size within tenths of a thousandth and even finer. The operator is literally able to "split tenths" because of the gage's superior accuracy.

Converting present installations to air is simple and causes negligible interference with production.

Ask for the complete story. Federal Products Corporation, 1911 Eddy St., Providence 1, Rhode Island.

The Arnoldair eliminates needle flicker. The operator can safely and consistently split that last "tenth".



The Arnoldair can also be installed to gage multi-dimensions. Here two dimensions, diameter and width, are being simultaneously checked.

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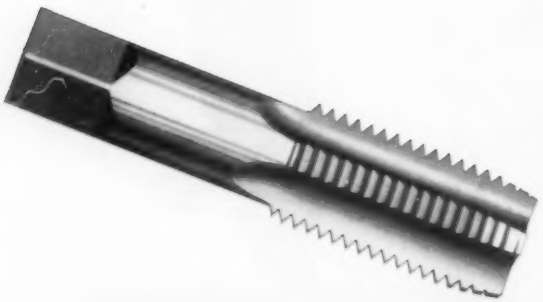
Largest manufacturer devoted exclusively to designing and manufacturing all types of DIMENSIONAL INDICATING GAGES

Need precision performance?

No question about...



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Now you can try amazing STADOIL for your diamond wheels—without cost! You'll get the same precision tool finishes already acclaimed by the more than 6,500 present users. Your diamond wheel manufacturer highly recommends STADOIL to remove gum or glaze and keep wheels from loading. One 8 ounce sample can will prove all we say about STADOIL . . . so clip the coupon and

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Please send postpaid the 8 ounce FREE SAMPLE of STADOIL

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HOW IT WORKS

A. Minor Load Penetration
B. Major Load Penetration
C. Linear measurement of penetration increase which "ROCKWELL*" converts to hardness reading

BRALE Penetrator Accuracy Is Proved in Wilson's Standardizing Laboratory

One point of hardness on the Rockwell C scale equals .00008", so penetrator accuracy must be constant. That's why Wilson maintains its Standardizing Laboratory for testing and approving every BRALE penetrator.

Each BRALE is precision ground to shape under high magnification to research laboratory accuracy. Wilson's BRALE Penetrator gives true readings at all dial points. For accuracy use a diamond BRALE penetrator on your hardness tester. Write for literature.

*Trade Mark Registered

ACCO

WILSON MECHANICAL INSTRUMENT DIVISION
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WILSON "ROCKWELL" and TUKON Hardness Testers

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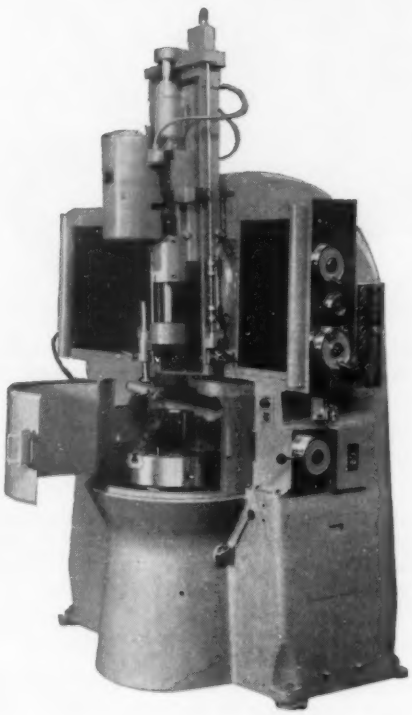
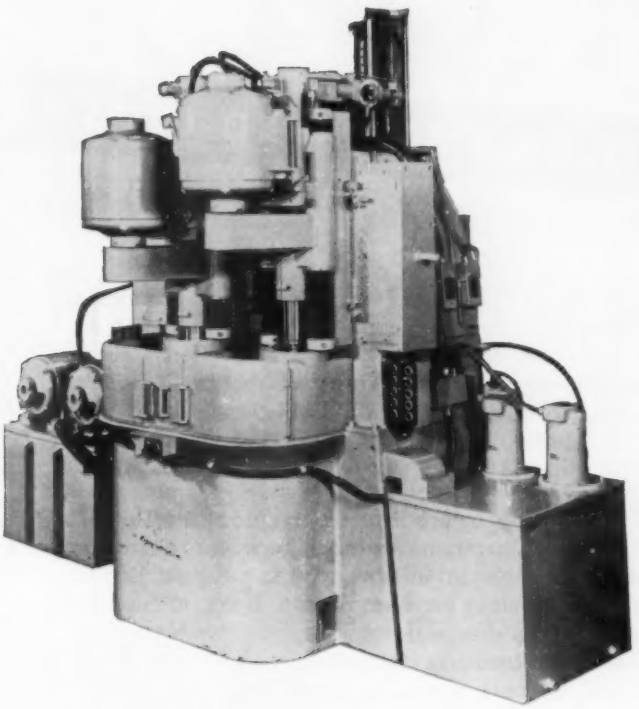
SPRINGFIELD

GRINDERS

the modern approach to chucking grinder operations



Vertical grinding of O.D., I.D., faces, tapers, shoulders, steps or combinations with one set-up. Holds extremely close tolerances on precision production. All slideways above grinding wheel. No gravitational pull; work sets solidly on vertical spindle. Greater work visibility; easier loading; more convenient control.



Dual spindle Vertical Grinder has individual operated spindles with individual controls and individual automatic cycles. Can be arranged for duplicate production or to handle consecutive operations on a single piece part. Higher production with less floor space and lower capital investment.

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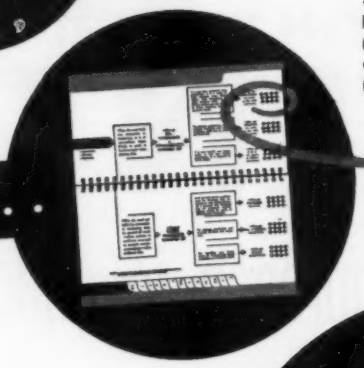
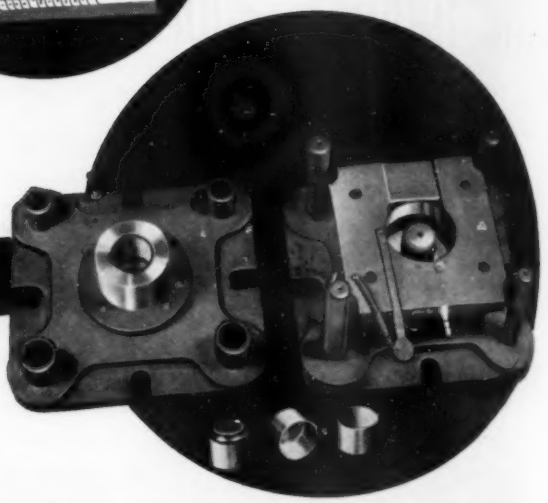
USED THIS GUIDE . . . . . —then use HAMPDEN (Oil-Wear) or No. 610 (Air-Wear)



TO HOLD DOWN UNIT COSTS . . .



AT which step in your tooling process would you welcome real help in reducing tool and die costs? Tool Steel Selection? Heat Treating?—or on-the-job "Trouble-Shooting"? Here's how you, like the maker of the Dies shown here, can start to reduce costs with a Method that helps you at *all 3* steps.

First, to simplify selection, use the handy Selector Section in the Carpenter Matched Tool Steel Manual. Quickly and surely, it enables you to put your finger on the proper steel for best results. Next, to further insure tool and die performance, use the Manual's complete heat treating instructions—they have been simplified beyond anything previously known. It's easy to get started—use the Carpenter Matched Set Method to help you "trouble-shoot" your present tool and die jobs.

For better, lower-cost tooling, put this practical, easy-to-use Method to work, now. Ask for the 189-page Carpenter Matched Tool Steel Manual—just see your Carpenter representative. The Carpenter Steel Company, 154 W. Bern Street, Reading, Pa.

Job:
Compound Blank and Draw Die for forming .031", ¼-hard brass Vent Valve Bodies at the rate of 103 per minute on a punch press.

Problem:
Unit costs were on the upswing because the old dies wore too rapidly, causing frequent and costly machine shutdowns for regrinding.

Solution:
Looking for a die steel with maximum wear resistance, the toolmaker referred to the Selector Section in the Carpenter Matched Tool Steel Manual, and quickly arrived at Carpenter *Hampden* (Oil-Wear).

Heat Treatment:
Simplified instructions in the Manual were followed.

Results:
2 hours of costly machine downtime were eliminated *each day*—production per grind *rose over 300%!* As a matter of interest, the toolmaker takes off approximately .0005" per stoning and gets about 100 grinds from the Blank and Draw Die.

IMMEDIATE DELIVERY FROM LOCAL STOCKS!

Call Your Nearest Carpenter Warehouse or Distributor

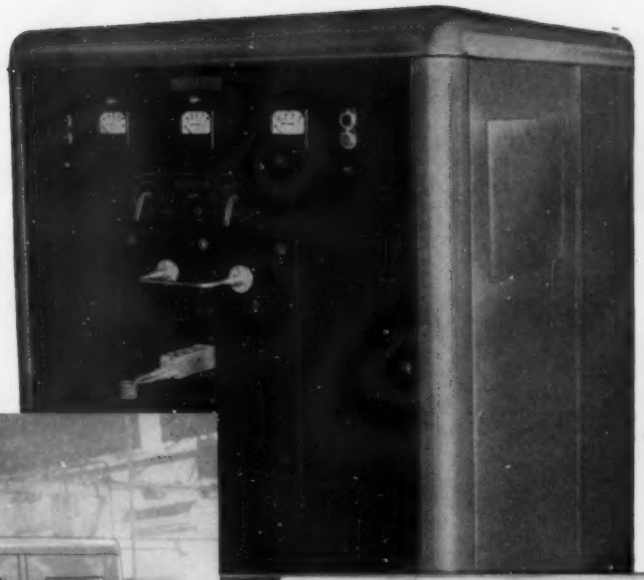
Carpenter STEEL

Matched Tool and Die Steels

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U. S. A. and Canada

T WENDT-SONIS A LINDBERG INDUCTION HEATING UNIT



ups tool tip brazing 135% . . . replaces two units

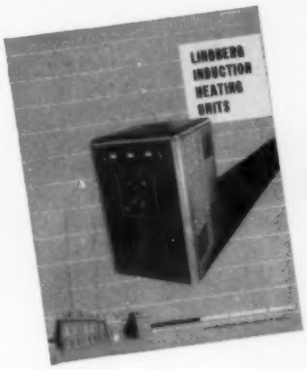
Production brazing of carbide tip tools has soared from 270 to more than 600 an hour since Wendt-Sonis, Hannibal, Mo., tool manufacturer, installed a Lindberg induction heating unit.

Two operators, fluxing parts and putting brazing metal and carbide tool tips in place, load the assemblies on a conveyor belt that passes a continuous stream of work through a specially designed, long hair-pin type heating coil.

Production is speeded because 14 tool assemblies . . . not just one . . . are in the heating field at any given time. The first tool on the conveyor passes *from* the heating area, leaving 13 others *still in* the field of heat, with tool number 15 *just entering* the coil area.

Production, formerly through two smaller units, totalled only 135 tools per hour, per unit, and required four operators. Thus the new equipment frees two operators for other important work.

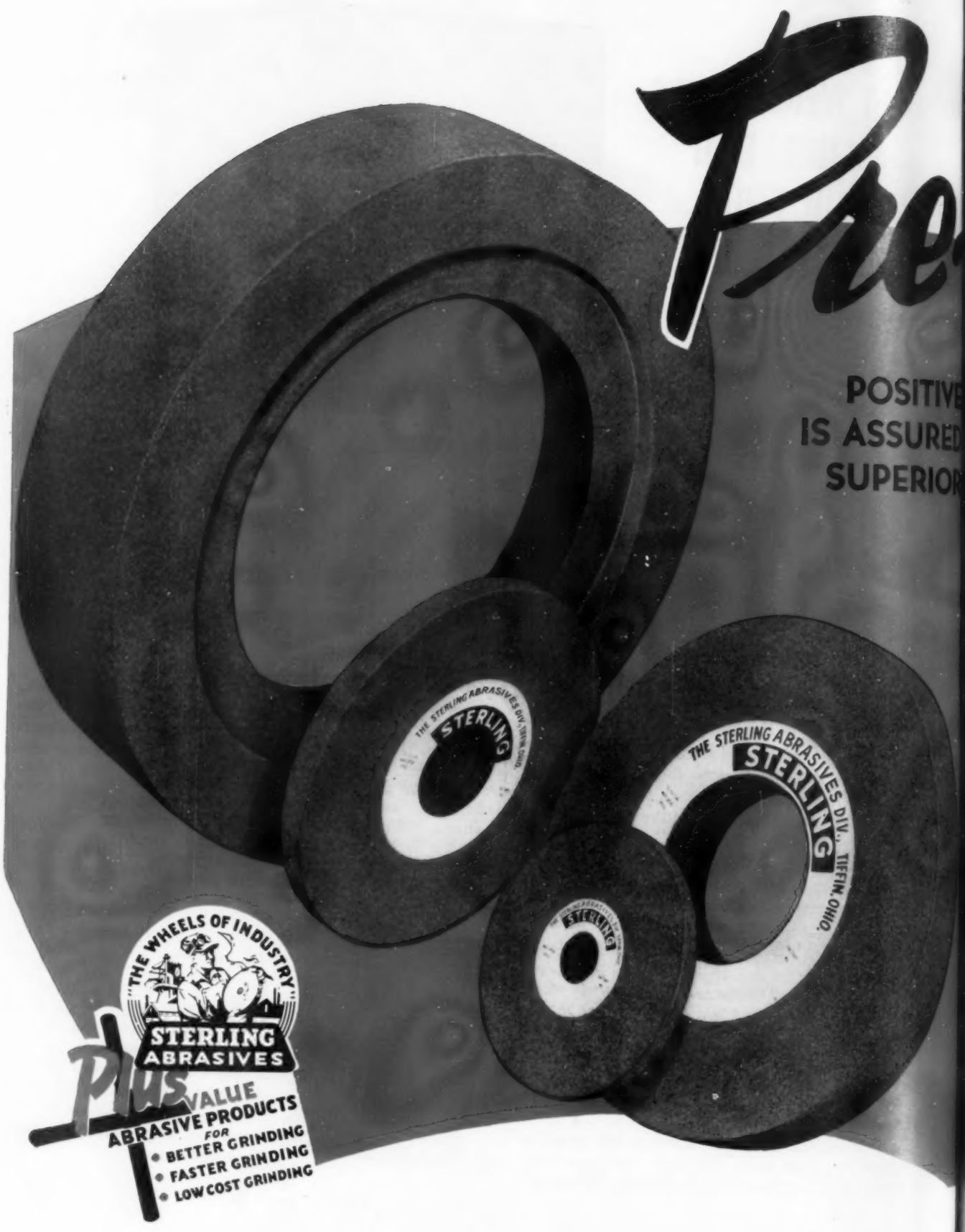
If your requirements call for production brazing, soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting, a Lindberg induction heating unit can better your production picture . . . minimize costs . . . increase profits.



Ask for a copy of Bulletin 1440. It pictures and describes standard models . . . illustrates 11 cost reducing features . . . lists applications . . . shows accessory equipment.

LINDBERG *HIGH FREQUENCY DIVISION*

Lindberg Engineering Company, 2447 West Hubbard Street, Chicago 12, Illinois



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● Wide variations in demands for all types of cylindrical grinding re satisfied by Sterling's "Wheels of Industry". The planning, care- l workmanship, and faster delivery built into these superior abras- e units always pay off big when on your jobs.

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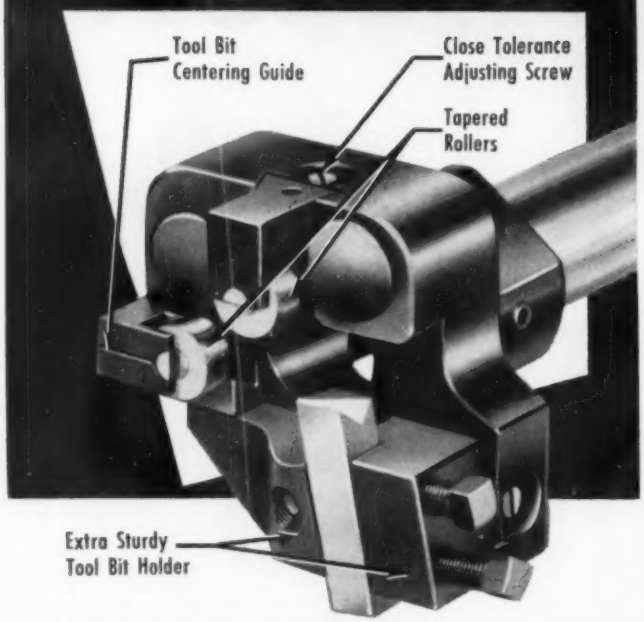
BOYAR-SCHULTZ SCREW MACHINE TOOLS

Standard Equipment in Progressive Shops



MODEL T TURNING TOOL

For automatic or hand screw machines as well as turret lathes. A box tool with the stamina to deliver piece after piece to close tolerance over long production runs. An outstanding feature is the speed with which set-up is accomplished. A predetermined center line on the roller block provides for rapid return of re-sharpened bits to precisely the same cutting position with a minimum of down-time.

More Production—Less Down-Time

Boyar-Schultz Screw Machine Tools are designed and built to eliminate the difficulties that ordinarily confront the screw machine operator.

Correct design and built-in sturdiness evident in Boyar-Schultz Tools, are the reasons for their close tolerance accuracy that contribute so much to profitable screw machine operation. Carried in stock for immediate delivery.

- Model T for Turning
- Model B for Turning
- Model C for Burnishing
- Model DRH Drill and Reamer Holder
- Model DA for Deep Hole Drilling
- Model K for Knurling
- Model A-T Tap Holder (Non-Releasing)
- Model D for Reaming
- Model AR Tap Holder (Releasing)
- Model AP for Pointing
- Model H Box Tool Adapter
- Model RS Revolving Stop
- Model RR Roller Rest
- Chucking Levers
- Cam Rollers and Pins
- Model G Grinding Fixture

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BOYAR-SCHULTZ Corporation

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ACCURATE AND DEPENDABLE!

SIMPLEX ENGINE LATHES

PARTIAL SPECIFICATIONS		
	10″	13¾″
Swing over bed:	10¼″	13¾″
Distance between centers:	19⅝″, 31½″	30″, 40″, 60″
Spindle speeds:	16	12
Speed range (RPM):	50-1600	47½-900
Motor:	¾—1½ HP	2—1 HP

Years of experience and reputation in the Machine Tool field confirm the high standards of these lathes in design, materials and workmanship . . . They are rigidly constructed for high efficiency and close tolerance, and will give long-time, economical service.

The Simplex lathes come with ground lead screw, complete range of American Standard threads, quick change gear box, spline shafts, heavily constructed and well ribbed bed to guarantee minimum vibration. All measurements are in INCHES AND DECIMALS.

Write us now for complete details!

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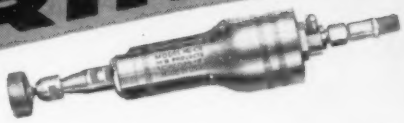
"M·B" Model HD·CR

40,000 RPM HEAVY DUTY Pneumatic GRINDER



A powerful, versatile tool—can be fitted with three different spindle noses to handle mounted wheels with ¼″ diameter shanks, also unmounted wheels with ¼″ diameter and ⅜″ diameter holes. Made with compound rotors. Fitted with steel body. Special grease-sealed bearings. Speed such as to operate Tungsten Carbide burrs, Rotary Files, etc., to their full efficiency.

Also Other Pneumatic Grinders

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Automatic Airline Filters and Lubricators

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M·B PRODUCTS
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DETROIT 3, MICHIGAN

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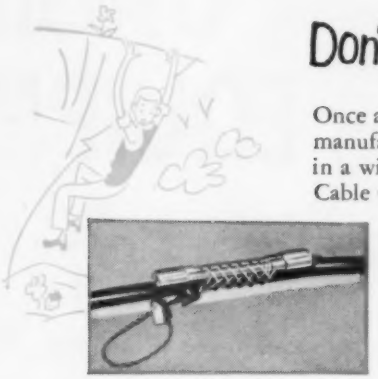
ANACONDA METALS AT WORK

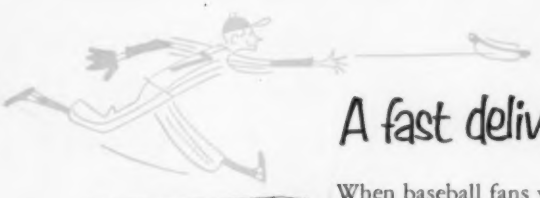
Meet the educated screw

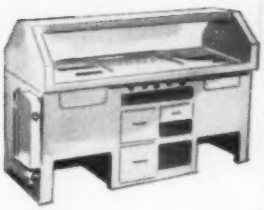
This is a whole family of screws, known as Screwsticks, and joined head-to-toe. Insert a Screwstick in the driver, aim it at the hole—and from there on the Screwstick tightens itself to the predetermined torque, shears itself and gets its head burnished by the following screw which automatically advances itself. It's so fast that American Screw Co. of Willimantic, Conn., which uses ANACONDA Hexagon Brass Rod, refers to it as "jet propulsion".



Don't lose your grip

Once a novelty trick developed by the Chinese, the manufacture of these grips is now an industry. Made in a wide variety of styles and sizes by Economy Cable Grip Co. of Norwalk, Conn., they are used to anchor suspended electric power cables and to seize the end for pulling through ducts. The harder you pull, the tighter they grip. Needless to say, the ANACONDA Bronze Cable, Everdur* Rod and Copper Tube used in their manufacture never weaken from rust.





A fast delivery...with mustard

When baseball fans want their hot dogs, they want them fast—so Stainless Alloy Fabricators of Detroit built this "Double-Header" baseball park hot dog server. Its big capacity for hot dogs—and fast service—is its double bun warmer, one at each end, heated by copper water boilers. If the water runs dry, it's no strike-out. Boilers are made of phosphorized copper sheet with joints formed by fusing the edges with a Heliarc torch. No solder used, no seams to burn open.

How to treat a fracture

A fracture often means long uselessness—but that needn't be true of machinery. Usually braze welding can make it good as new and at a fraction of the time and cost of replacing it. This fractured cast iron conveyor drive sprocket, for example, would have taken two months to replace. The Universal Welding Co., Rochester, N. Y., repaired it in only 7 hours by braze-welding with ANACONDA-997 (Low Fuming) Bronze Welding Rod. Moral: don't count the patient out before consulting your welder.

There's more to this than meets the eye

In our Technical Department you will find a range of experience that covers the entire field of copper and copper-alloy applications in the metalworking industries. If you have a problem of metal selection, we are at your service. *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

*Reg. U. S. Pat. Off. 5391

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  (JOHANSSON) and accessories. Short deliveries. Inspection and reconditioning service available at our plant
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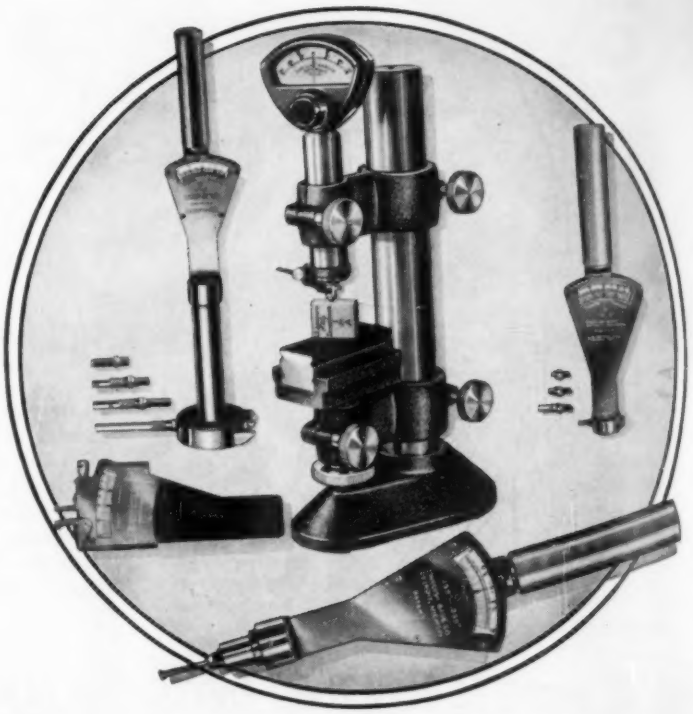
  (Amplifier — for outside measurements) Graduations .0001 to .000002 or .001 M to .0002 M
- **OTHER JOHANSSON PRODUCTS**
  Micrometers, Snap gages, Extensometers, Dynamometers, Hardness Testers, Surface Finish Indicators



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C. E. JOHANSSON GAGE CO.

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Look to MODERN for accurate, fast, economical thread cutting

Hardened and ground throughout

Wider threading range

Made with least number of parts

Cut close-to-shoulder threads without special chasers

Easily adjusted for thread size

Greater flexibility

Quick and easy chaser change

MODERN
STATIONARY TYPE SELF-OPENING
DIE HEADS

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- CHASER GRINDING FIXTURES

Modern Self-Opening Die Heads thread diameters from ⅛″ to 7″ in standard heads, and up to 14″ in special heads . . . accurately, fast, and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes, and other machines where the die heads are used in a stationary position.

For complete information, write for Bulletin No. M-124

MODERN TOOL WORKS
DIVISION
CONSOLIDATED MACHINE TOOL CORPORATION
SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED
ROCHESTER, NEW YORK

HERE'S A COOL SOLUTION TO A HOT PROBLEM!

LO-JET ACRO

The revolutionary new cooling system that*

KEEPS CUTTING TOOLS AND WORK AT ROOM TEMPERATURES!

*Proven results at leading automotive manufacturers.***

eight outlets

SPEEDS PRODUCTION

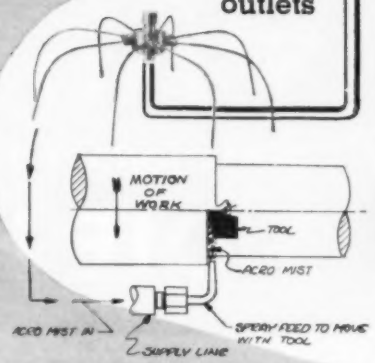
CUTS COSTS

USED FOR ALL MACHINING OPERATIONS

PROLONGS TOOL LIFE

CUTS TOOL BREAKAGE LOSS

IT'S CLEAN, TOO!



One unit can service up to 8 operations

*Controlled compressed air operation for all types of metal cutting with special ACRO-COOLANT soluble solution.

**Names on request.

Our engineering staff will cooperate FREE of charge. Send blue-prints for estimate.

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Greater **ACCURACY IN TAPPING AND REAMING**

Types to fit any machine used for tapping or reaming.

The easiest way to assure greater accuracy in tapping and reaming is simply to change over to a type of tool holder specially designed to take care of inaccuracies in set-up.

Take the Ziegler Tool Holder, for example. By compensating for inaccuracies of as much as 1/32" radius or 1/16" diameter, the Ziegler makes it possible to obtain fine-tolerance production without the time-wasting chore of securing perfect alignment of the work with the spindle.

Try it and see how it will enable you to turn out work that meets the highest standards of precision.

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Projection equipment furnished if you haven't your own facilities.

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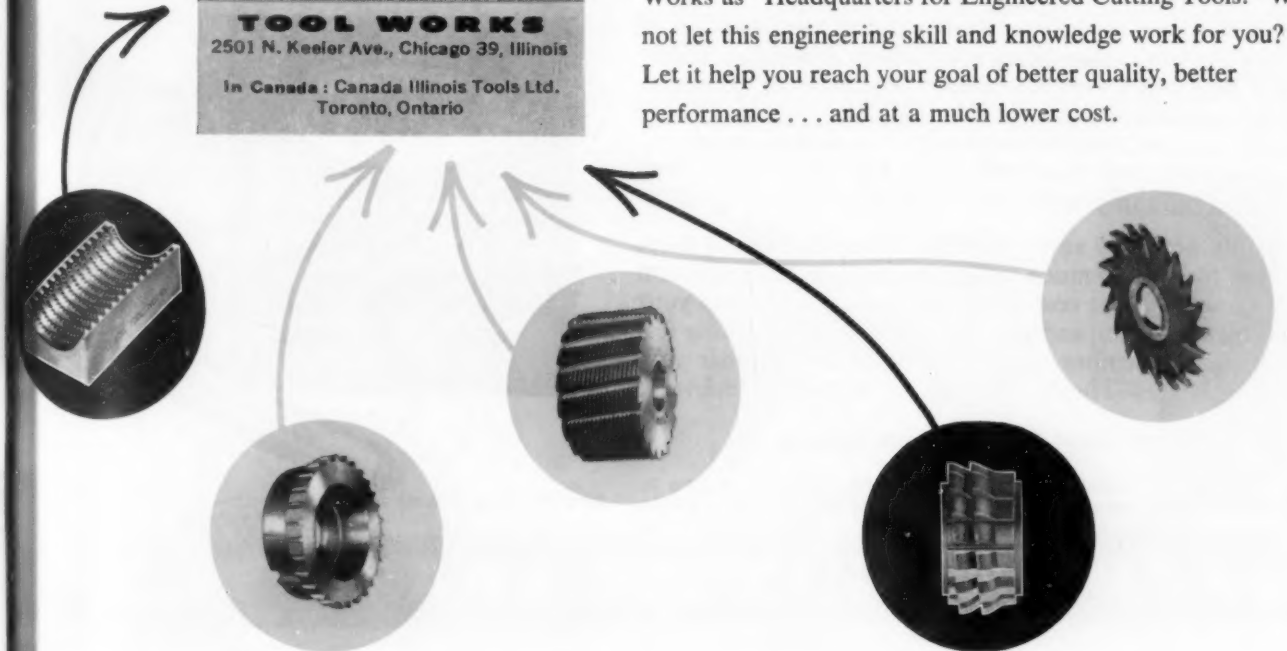
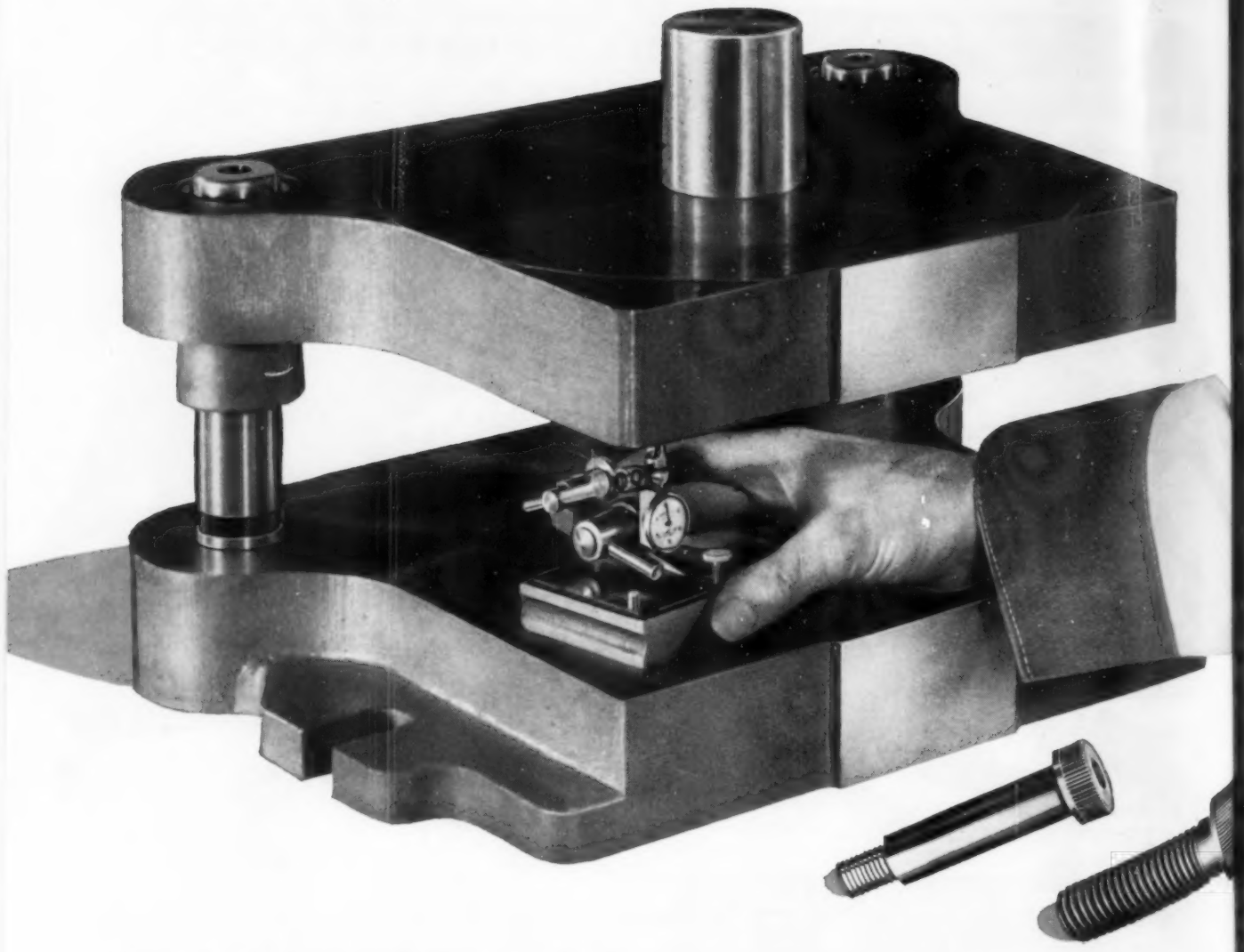
One look at the championship record of Illinois Tool Works' cutting tools tells you that's the "team" that can't be beat. Here is real performance! More than forty years of leadership based on the pioneering of metallurgical and production techniques . . . a fact that has established Illinois Tool Works as "Headquarters for Engineered Cutting Tools." Why not let this engineering skill and knowledge work for you? Let it help you reach your goal of better quality, better performance . . . and at a much lower cost.





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How to Produce and Measure

Precision Flatness and Finish...

On Metals, Ceramics Quartz and Plastics

Many industrial laboratories are using the Lapmaster in experiments with flatness and finish. In some cases experimental work is carried on in the laboratory and, as a result of the consistency of this machine in producing precision flatness, larger Lapmasters are put into production in the manufacturing line. One such manufacturer of steering gear assemblies saved considerable time over hand lapping of washers and worms. Schools and manufacturers engaged in restricted defense work are finding and utilizing advantages of the old operation of lapping when produced by modern Lapmasters. If you are interested in precision flatness and finish, it will pay you to investigate the Lapmaster. For instance:

Consistent Flatness of 1 Light Band (.0000116") Opens Countless Possibilities For Product Improvement

Manufacturers of pumps, compressors, and equipment containing liquids or air under high pressures have found it possible to eliminate gaskets in mating surfaces because of the extreme accuracy of work produced by the Lapmaster. Quality of surface (RMS) is controlled by Lapmaster compounds. Micro-inch finishes of 2 to 3 RMS are common. Surface flatness can also be held to less than one light band or .0000116". (11.6 millionths of an inch.)

LAPMASTER'S New Principal in Machine Design Offers Cost Reduction *Plus* Consistent Accuracy

Lapmasters are extremely versatile lapping machines. Precision flatness and super finish can be generated in both small and large production quantities. In one cycle, Lapmasters can precision-lap either identical parts or parts of dissimilar shapes and materials.

LAPMASTER Monochromatic Lights and Optical Flats

Here's the equipment you'll need for checking accurate lapping.

The Monochromatic Light is a sturdy, completely self-contained and portable precision instrument that can handle any size part. Reversible light head permits checking normal size pieces on the stage, larger parts on a table. Light is of high power to show visible bands on relatively long polished surfaces and materials difficult to check. Power supply is a 5000 volt transformer operating on 110-120 V., 60 cycle current.

Lapmaster Optical Flats offer the most accurate standard of measurement available. They are made of highly transparent quartz which holds its shape indefinitely, is abrasion resistant and resists thermal shock. Flats are available to a standard of either 1/10 or 1/5 of a light band across their diameter.

Additional Data

Full facts on Lapmaster production lapping — Flatness interpretations available in two illustrated booklets. They are yours for the asking.

Crane Packing Company, Dept. TE-11, 1823 Belle Plains Avenue, Chicago 13, Illinois

JOHN CRANE

CRANE PACKING COMPANY

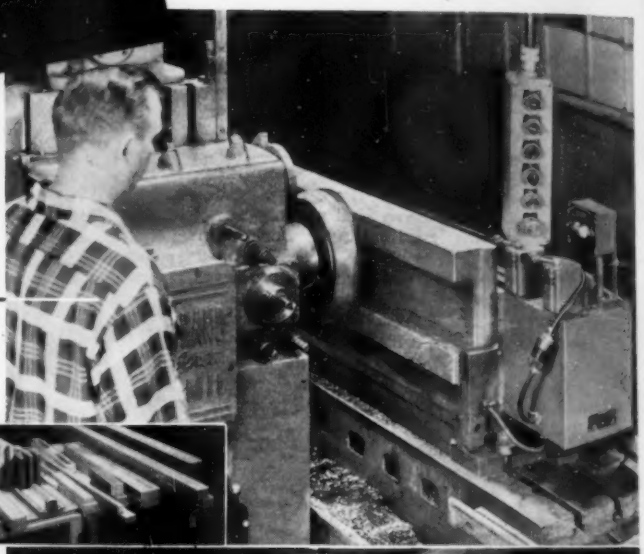
Get Profitable Methods *plus* Advanced Machine Design

from . . .

SUNDSTRAND "Engineered Production" Service

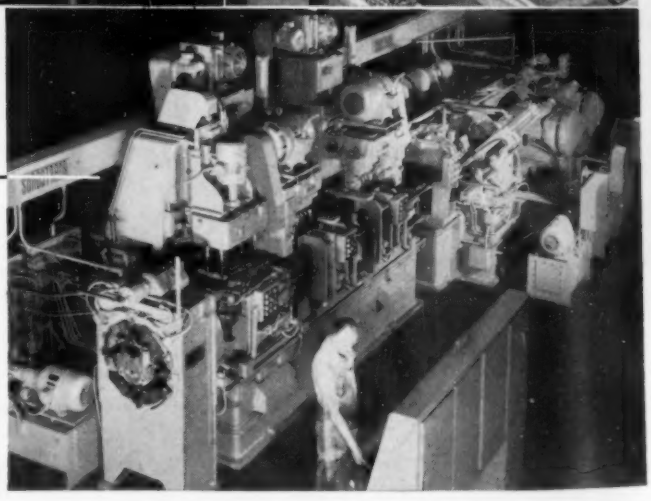
Here are some representative examples of machine tools and services offered by the Machine Tool Division of Sundstrand. Standard basic machine designs and units, coupled with methods engineering assistance, have resulted in many cost-saving Sundstrand installations. If you have metal working operations in your plant and are interested in lowering manufacturing costs, call in a Sundstrand representative. He'll be glad to assist you in obtaining more economical methods. There is no obligation for this service.

Small Lot Milling with Fast Magnetic Clamping



Sundstrand Model 33 Rigidmil equipped with a Sundstrand Magnetic Fixture. Parts machined include tool blocks, cam bars, tool slides, motor brackets, etc. Lot sizes vary from 1 to 25 pieces, and time reduction averages 50% over former method. In addition to saving time through the elimination of mechanical clamps, these magnetic fixtures save the costs of special jigs or fixtures.

Multi-Station Automatic Transfer Rigidmil



Here is an interesting example of Sundstrand "Engineered Production" as applied to interlocking several machine elements into continuous flow production. It is a Sundstrand special purpose 9 station transfer or process type machine designed and built to drill and ream locating holes, mill bearing sides and odd pads on cylinder blocks. Controls are operated from a floor mounted console type control station and are designed to cycle the complete unit individually or provide complete interlocking of the cycle with several other machines. Production is 80 pieces per hour.

SUNDSTRAND "Engineered Production" Service*

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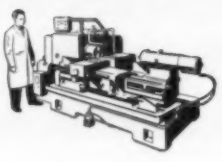
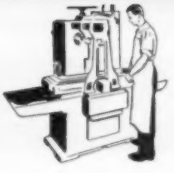
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

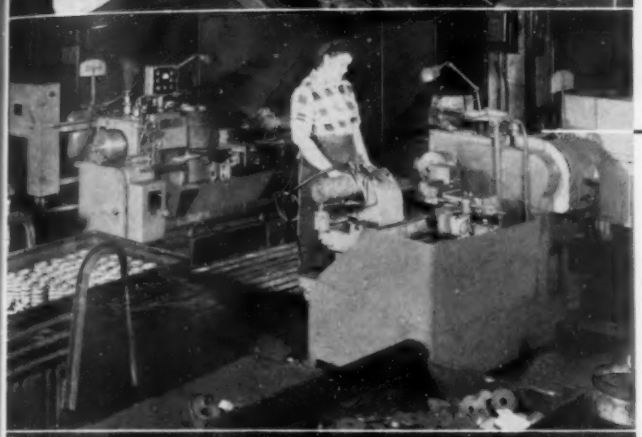




Hopper Loading for Production Turning

This Sundstrand Model 8A Automatic Lathe turns and chamfers three different lengths and diameters of master track link pins. Operator loads parts into a hopper loader and automatic machine cycle is started with chucking of part.

When machine cycle is completed and the front slide has returned to the starting position, a work ejector pushes the pins out of the chuck and into the unloading vee. Machine will run automatically with one filling of the hopper for approximately 10 minutes.



Small Lot Turning

Illustration at left shows two of a battery of Sundstrand Automatic Lathes that increase production better than 2 to 1 over former method. Lot sizes, for the many different parts run over these machines, vary from 150 to 200 pieces. Parts are of cast iron and steel and are used in production of heavy machinery. The units in this battery of Automatic Lathes are installed with facing fronts, as shown in the above illustration. Because of the simplicity of operation, one operator can easily run two machines.

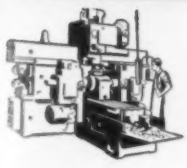
Multi-Station Automatic Indexing Machine

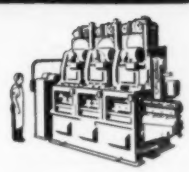
Special Sundstrand Five Station Process Machine for milling port faces and angle pads, drilling port faces and counter-boring angle pad of manifold part. This irregularly shaped part is located and clamped at station #1 and then indexed thru the remaining four work stations to complete the machining with one handling of the workpiece. Production is approximately 115 pieces per hour.

FREE DATA

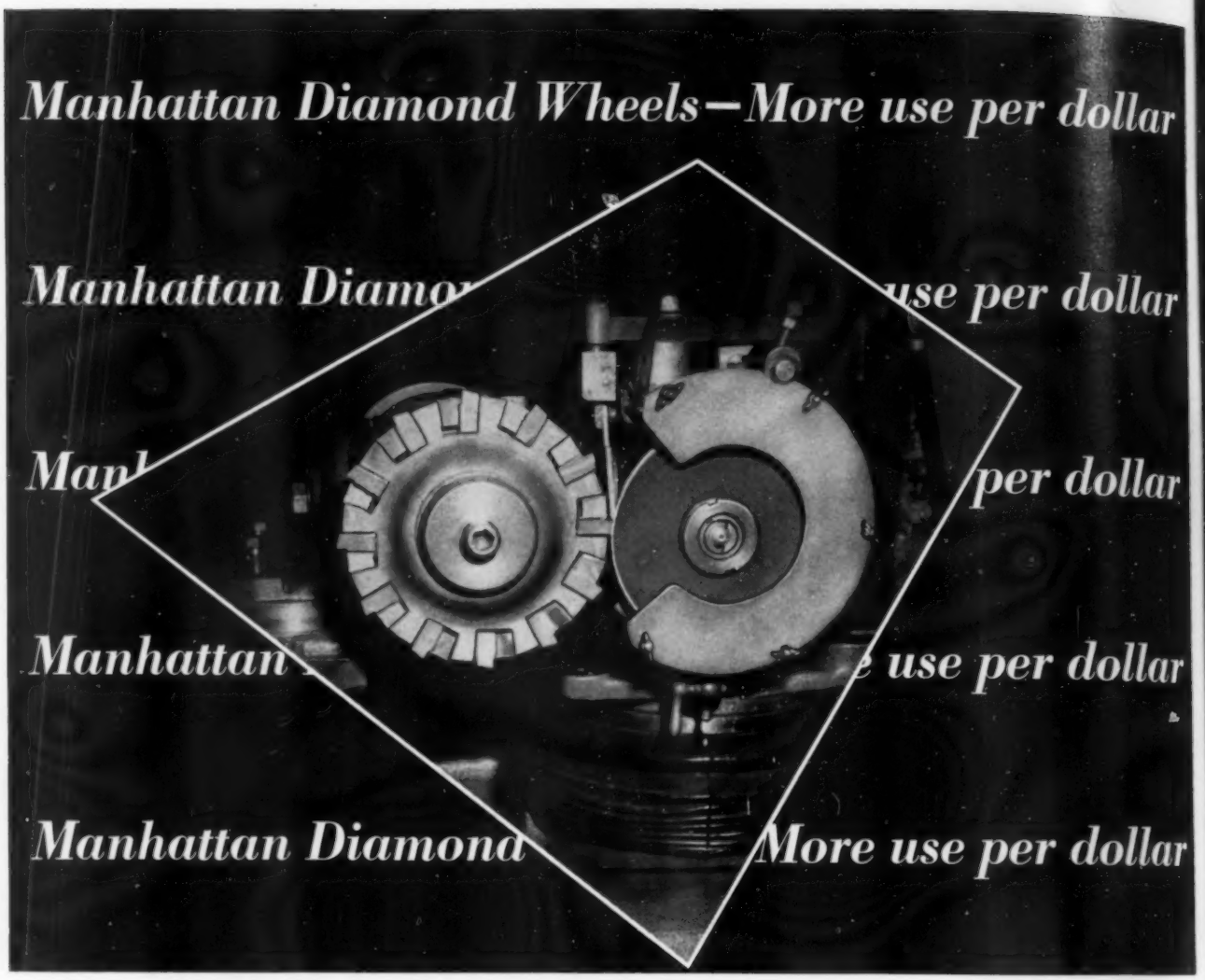
Additional information on the complete line of Sundstrand machines is available. Ask for bulletin SP 737.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2540 Eleventh St. • Rockford, Ill., U.S.A.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FOR ECONOMY AND PRECISION . . . specify Manhattan Diamond Wheels . . . and see why Manhattan leads the field. For carbide, quartz, synthetic sapphire, and soft or hardened steel . . . for internal, surface, and cylindrical operations, Manhattan Diamond Wheels give you the fastest, coolest cutting. One reason — Manhattan's special resin bond which resists loading or glazing when used against carbide tipped tools with steel shanks . . . makes dressing or lapping unnecessary. When you specify Manhattan Diamond Wheels, you are buying MORE USE PER DOLLAR . . . lowering costs . . . building profit.

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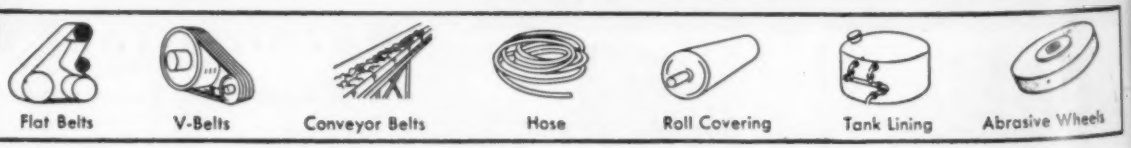

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APEX TOOL BITS FIT MOST STANDARD HOLDERS

If you haven't yet changed to Apex, you can get acquainted with APEX QUALITY by using Apex tool bits in your present holders. The Apex line includes Single-Point, Round Shank, as shown above, and Shankless Serrated. There are also Apex inserted-blade cutters of many styles: Millers, End Mills, Reamers, Slotters—you name it, we'll supply it!

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This bank of Sixteen Avey Drilling machines are all equipped with Gusher Coolant Pumps.

In choosing a coolant pump for your metal cutting machinery it pays to standardize on the *best*, a Ruthman Gusher Coolant Pump. Leading machine tool manufacturers have learned by experience that Gusher Coolant Pumps are precision built to give better service, and greater production. That's why so many of them use Gusher Pumps exclusively on their machines.

Always specify Gusher Coolant Pumps—You'll eliminate coolant problems.

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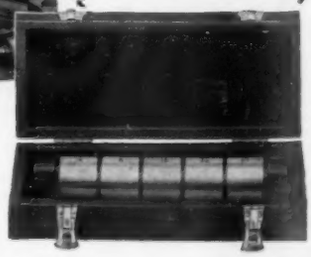

Consists of various surface specimens, *individually finished* to definite micro-inch readings, grouped together in one handy comparison bar. Merely hold bar opposite work for fast, visual comparison check of surface roughness, waviness and lay.

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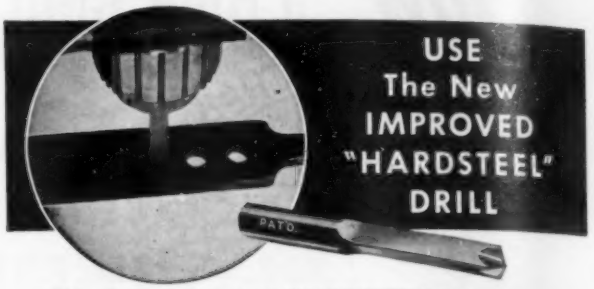

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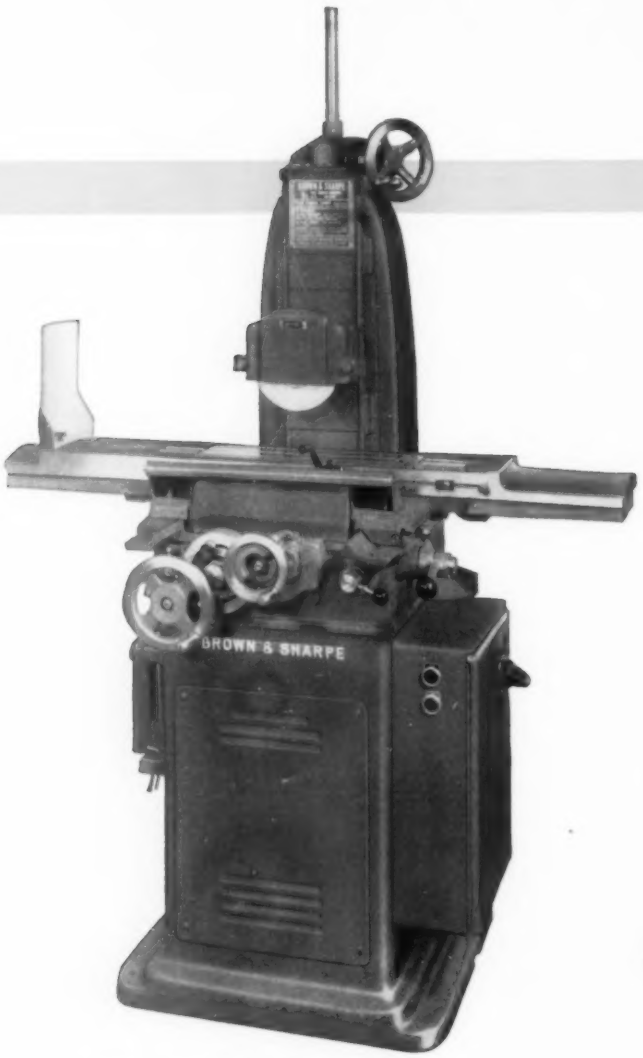

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These machines, long famous for their economical production of small to medium-sized precision work, give you the advantages of automatic lubrication and ample guarding to reduce maintenance costs and extend machine life. Removable unit-type precision wheel spindle, plain-bearing or antifriction-bearing — and rigid column construction — provide exceptional grinding finish with quick spark-out. The No. 2LB Machine with Hand Feeds Only is ideal for toolroom and production work where automatic feeds are not needed. No. 2L (illustrated) and No. 2LB grind work to 18″ long, 6″ wide and 9½″ high, using a wheel 7″ in diameter.

Write for detailed specifications on these machines.

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Where precision, fine finish, and rapid stock removal on flat surfaces are equally important, this productive hydraulic-type machine quickly pays for itself. Automatic hydraulic table feeds are powerful, smooth, quiet and infinitely variable. Centrally-located controls permit rapid set-up and easy operation. Flange-mounted removable unit-type wheel spindle provides accuracy of alignment — choice of plain-bearing or antifriction-bearing types. You'll find many other features for speed, safety, accuracy and long life that make the No. 5 ideal on both toolroom and production grinding for work up to 24″ long, 8″ wide and 11″ high.

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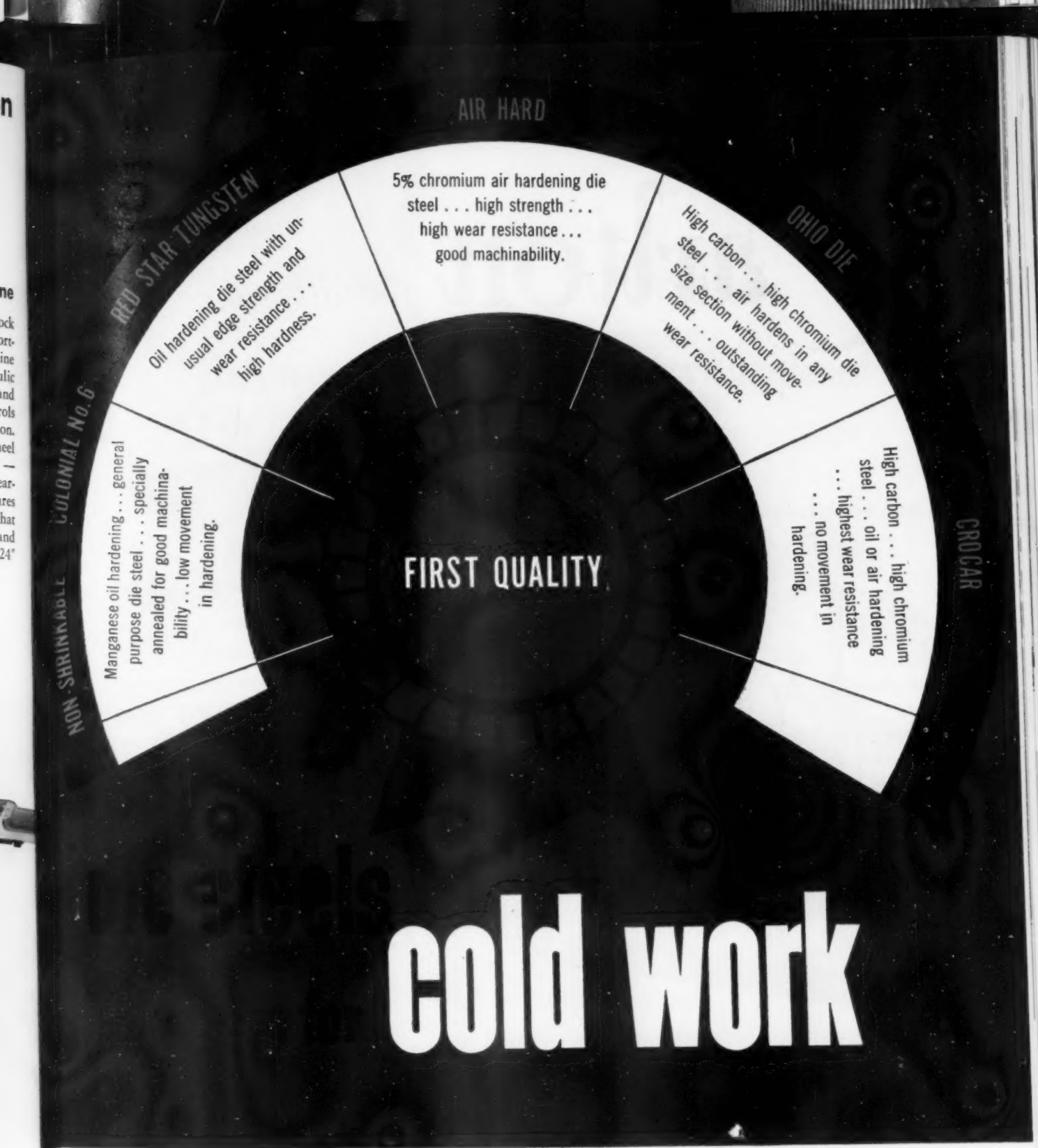
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5% chromium air hardening die steel . . . high strength . . . high wear resistance . . . good machinability.
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Manganese oil hardening . . . general purpose die steel . . . specially annealed for good machinability . . . low movement in hardening.
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Oil hardening die steel with unusual edge strength and wear resistance . . . high hardness.
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These Die Steels for Cold Work are designed to cover every performance requirement, and for adaptability to available heat treating facilities. Each grade is carefully annealed and fully inspected by magnaflux, reflectoscope and deep etching to insure First Quality selection. Our Representative in your area will gladly assist you with your needs.

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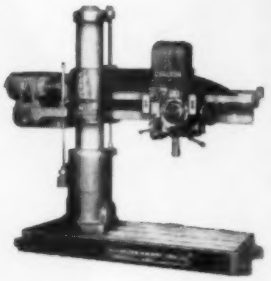
11″ col. 3′-4′-5′ arms



3A---- 13″ col. 4′-5′ arms
15″ col. 4′-5′-6′ arms
17″ col. 5′-6′-7′ arms

4A---- 19″ col. 6′-7′-8′ arms

5A---- 22″ col. 7′ to 10′ arms
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☐ 4A ☐ 5A

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Company.....

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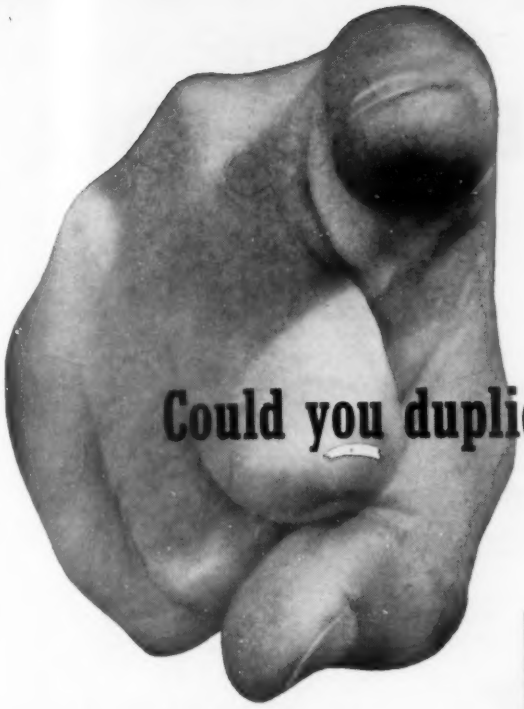
another reason why owners say—



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1. LAMINATED CONSTRUCTION Through Ohio Knife's own process, long-wearing tool steel is welded to a soft steel backing under 2500 tons pressure. This process enables us to deliver ways answering any requirement for hardness, regardless of the shape of the way.

2. SPECIAL HEAT-TREATMENT OK ways' extreme hardness (65-66 Rockwell "C") to a uniform depth is a key factor in successful performance regardless of shape.

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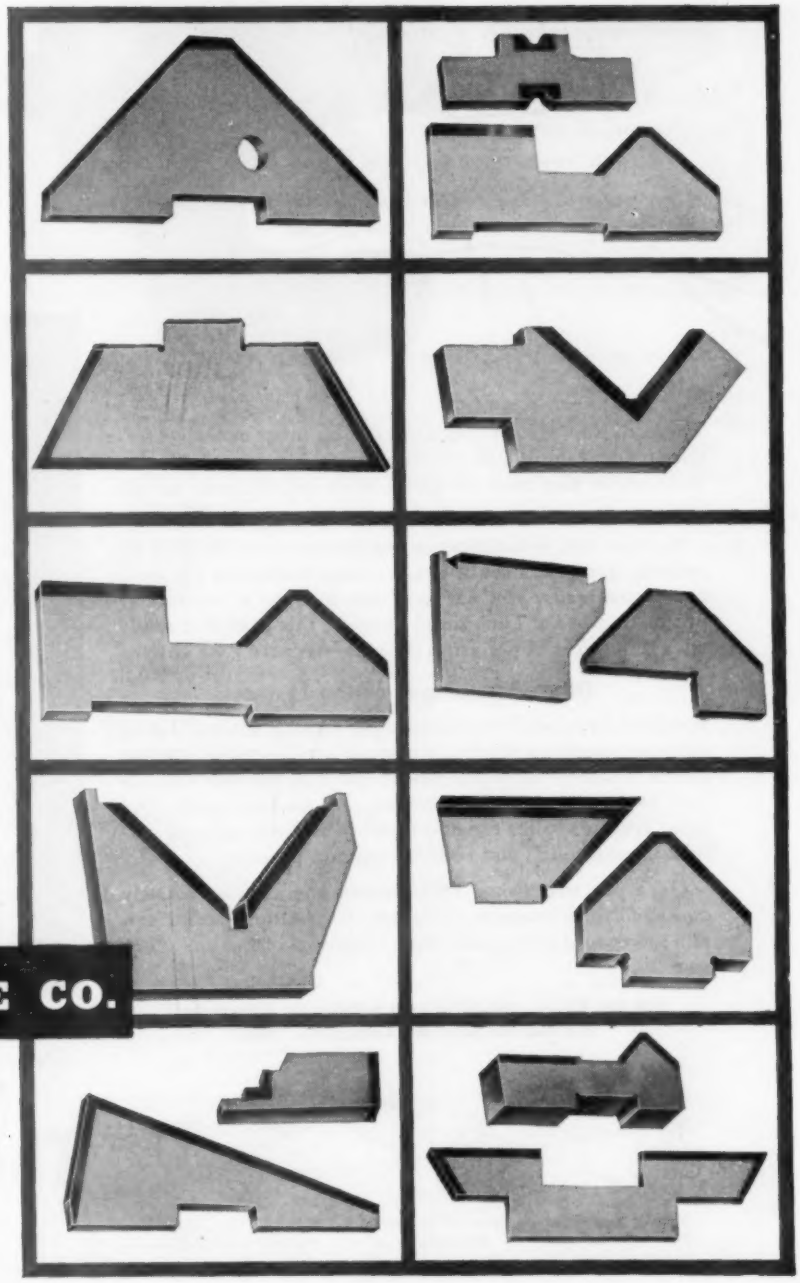

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CINCINNATI 23, OHIO

Manufacturers for the Metal Working Industry of:

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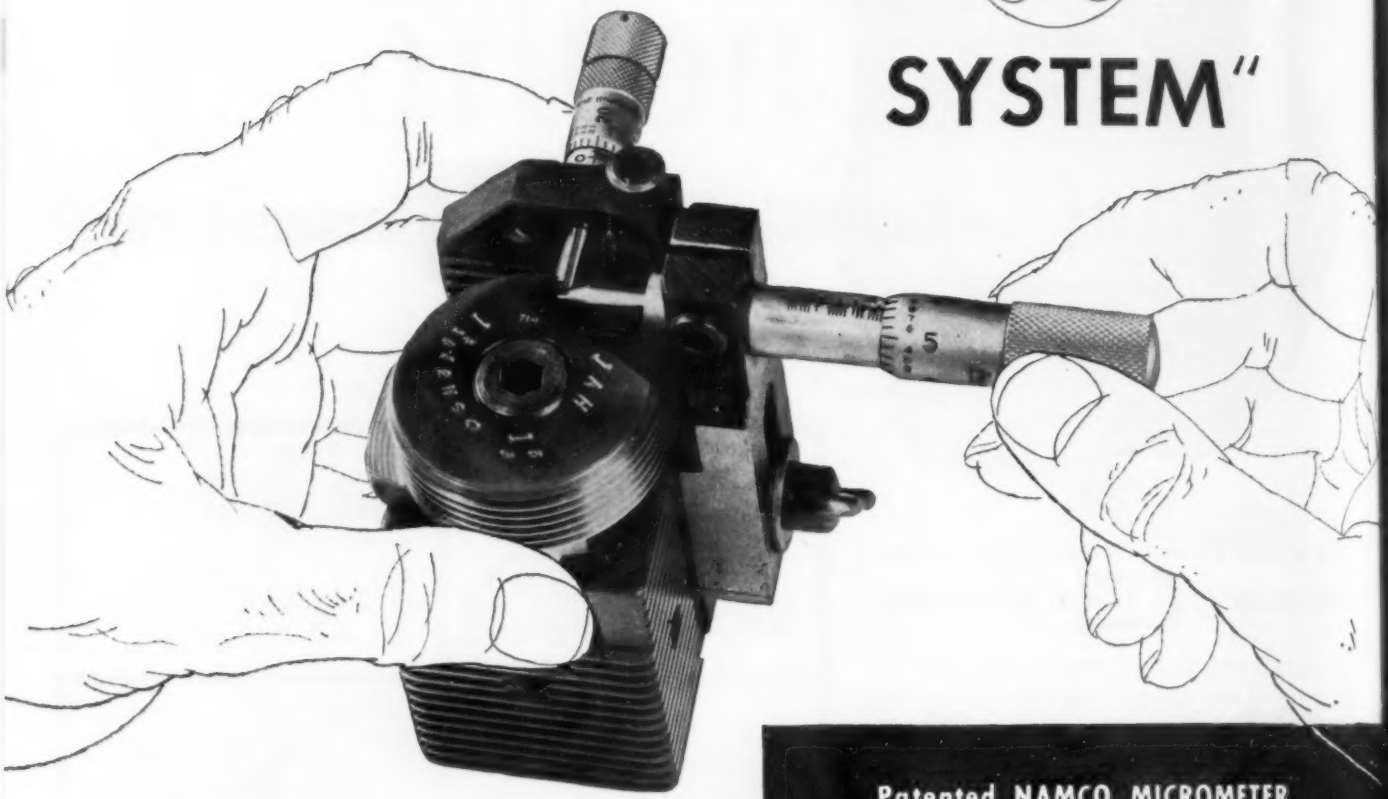
another reason why owners say—

"We use the VERS-O-TOOL SYSTEM"



They call it a "system" because, among other exclusive features, Vers-o-tools are provided with a patented Namco Micrometer that takes the guess-work out of chaser grinding.

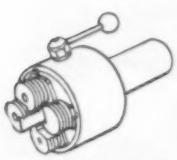
No trial cuts, no adjustments, no time or scrap loss. And by providing an extra set of chasers, kept ground in the toolroom and ready, you put long run jobs on a continuous production basis. Time saved by using this gage frequently adds thousands of precision threads—reduces your costs.

Other Advantages of the System

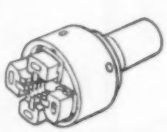
Standard Vers-o-tools use either the famous ground thread circular chasers or the lower cost, adjustable-blade, ground thread chasers—interchangeable die size for die size, in both revolving and non-revolving self-opening heads. The same system applies for end forming and end turning cutters. Use of knurls and rolls is common practice.

Once you start using Vers-o-tools, you are immediately equipped for a more versatile use of threading equipment, at a lower tool investment, than is possible from any other source.

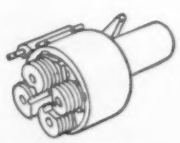
Ask for DT-52, complete new catalog on Vers-o-tool and Namco Solid and Collapsible Taps.



Style DS Vers-o-tool (Non-revolving Type) 10 Sizes, ⅜"—6½".



Style DR Vers-o-tool (Revolving Type) 13 Sizes ⅜"—6½" Shown with Adjustable Blade Chasers 7 Sizes, ⅜"—2".



Style DBS Vers-o-tool (for B&S Automatics) 3 Sizes, ¼"—½".

Patented NAMCO MICROMETER takes the guess-work out of chaser grinding

THIS IS THE WAY IT WORKS:

★ Remove chasers from Vers-o-tool head (in one minute) and take a micrometer reading.

★ Regrind them to the same micrometer reading. (Perfect control of the grind is automatic through serrated mounting of circular chasers—rechecking on the gage proves their uniformity.)

★ Replace chasers in head (one minute) with certainty that they will cut threads *identical* to those cut on previous grinds.

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Efficient Stripping of Painting Rejects

When the volume of painting rejects slows down your rate of production—as may occur in the manufacture of rigorously-inspected defense equipment—it is time to plan an efficient method for stripping the faulty coatings.

The rejected parts represent a considerable investment in the cost of metal and the cost of fabrication. To hide 5% of your total production in a corner is like hiding 5% of your working capital in a sock. The quicker you reclaim those rejects and push them through as accepted parts, the better profit you make on your contract.

Sometimes the time element dictates more efficient stripping. Suppose that a sub-contractor undertakes to produce 100,000 parts in 20 days. Suppose also that he averages 5% rejects and that he lets them pile up until he has 5,000 to strip and re-process on the 20th day.

On that day he discovers with sorrow that it is a lot harder to strip and repaint 5,000 rejected parts than it was to paint his regular daily quota of 5,000 new parts. He misses his deadline and suffers embarrassment that could have been avoided by stripping 250 rejects each day for 20 days instead of 5,000 in one day.

Don't Take Off Tomorrow What You Can Strip Today

Furthermore, it usually is much easier to strip the parts on the day they are rejected. Even though the parts were thoroughly baked in the ovens, it is still true that the longer the paint ages on the metal the harder it is to remove by any method of stripping.

Another point is that the easy method of dumping the rejects into an out-of-the-way tank for overnight soaking frequently is not the best way to strip the paint. Some paints cannot be removed by immersion in any one stripper, be it alkaline or acid or solvent. Yet many such paints respond quite readily to the right combination of two of these strippers.

Rinse Wisely

The technique of rinsing is also important. Some paints yield only to a hot alkaline stripper followed by a hot rinse. Sometimes a cold rinse following a hot immersion seems to provide a shock that removes the paint with great speed.

The economy of finding the best stripping method is so great that it merits careful planning. It may also require the advice of a man who has had plenty of experience with all types of stripping operations. Such a man is the Oakite Technical Service Representative in your city.

At the command of the Oakite Representative are more than a dozen stripping materials that reclaim rejects with great speed and effectively strip conveyor chains, racks and hooks. These materials include:

1. Alkaline strippers that remove many types of paints and are also excellent for "killing" the overspray in water-wash paint booths.
2. Solvent strippers that are especially effective on the newer types of synthetic lacquers.
3. A viscous solvent stripper of special value because it adheres to vertical and inverted surfaces.
4. A solvent stripper and an alkaline stripper especially designed for safe removal of zinc chromate primer from aluminum.
5. An acidic material that strips certain organic finishes and simultaneously removes oil and rust.

For more information, phone your local Oakite Technical Service Representative or mail the coupon at the right.

WHAT'S THE BEST WAY TO STRIP METAL PARTS IN LARGE VOLUME?
See page 9
how to STRIP PAINT
with Oakite Materials & Methods
OAKITE PRODUCTS, INC.

Oakite's FREE booklet on "How to STRIP PAINT" answers many questions that will lead you to better stripping procedures. You'll want to read more about:

- ¶ What's the best way to strip paint from metal parts too large to be soaked in tanks? *See Page 3.*
- ¶ What's the best way to strip large areas of structural metal where a steam supply is available? *See Page 5.* Where steam is not available? *See Page 7.*
- ¶ What are the best ways to prepare stripped surfaces for repainting? *See Page 11.*
- ¶ What strippers are best for removing oil-base paints? . . . Synthetic enamels, alkali-resistant plastics or resin-based paints? . . . Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas? *See Page 12.*

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A NEW *Lo-swing* PRINCIPLE OF WORK LOADING AND WORK TRANSFER WHICH WILL FURTHER CUT TOMORROW'S MANUFACTURING COSTS

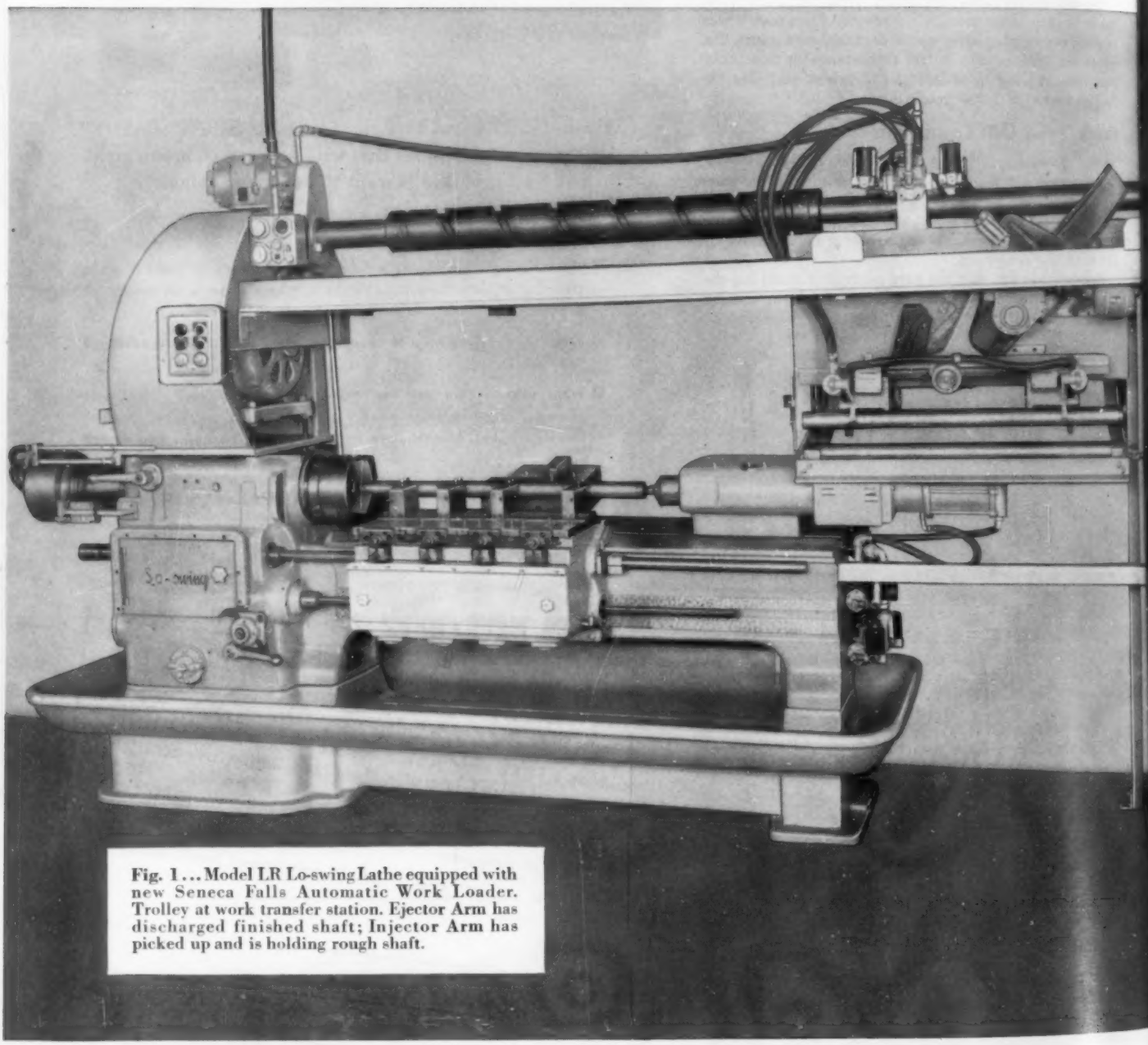

Fig. 1... Model LR Lo-swing Lathe equipped with new Seneca Falls Automatic Work Loader. Trolley at work transfer station. Ejector Arm has discharged finished shaft; Injector Arm has picked up and is holding rough shaft.

PRODUCTION COSTS

THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

THE NEW SENECA FALLS WORK LOADER is designed primarily for handling electric motor, axle and other types of shafts, with or without flanges, in varying lengths. It can also be adapted to handle certain sizes of projectiles.

The loading movement imitates hand loading manipulation, thereby clearing without interference all front and rear tool blocks, the vertical slide attachment, steady rests, and also leaves the front of the machine clear for the tool setter when it is necessary to adjust tools.

The loading trolley, shown in the accompanying illustrations is in a stationary position while the loader arms rapidly remove the finished part and inserts a rough part in position between the centers. On completion of the loading operation, and during the cutting phase of the machine cycle, the trolley moves to the tailstock end of the machine, where the finished shaft is discharged and a rough piece picked up by the loader arms. This movement accomplished, the trolley moves forward to the loading position just as the machine cycle is completed. This feature eliminates loss of time waiting for the loader.

Although the machine is equipped with push button controls for each movement to facilitate set up, the entire loading, machining and ejecting operations are all automatic. This automatic sequence is controlled by a system in which each movement is initiated by the completion of the preceding movement. A swinging cradle located at the tailstock end of the lathe connects with work transfer conveyors which feed rough work to the machine and transfer finished work to other machines or gauging stations for succeeding operations.

The significant advantages of this new principle of automatic work loading and work transfer are: assured safety for operator and system; complete elimination of operator's fatigue; wide range adaptability and an impressive acceleration of net output through the entire manufacturing sequence of a given part or product component.

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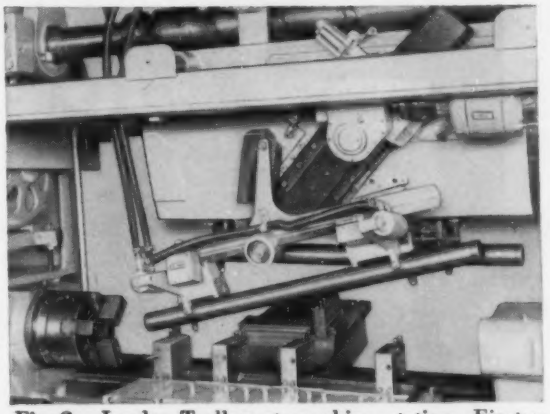

Fig. 2...Loader Trolley at machine station. Ejector Arm has picked up finished shaft. Injector Arm is tipping and lowering a rough shaft. Headstock spindle is stopped, chuck jaws open and tailstock center retracted.

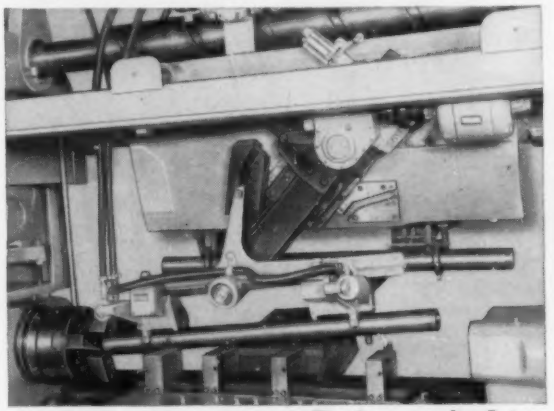

Fig. 3...Conditions same as in Fig. 2, except that Injector Arm is now bringing rough shaft to the horizontal position for entry into chuck jaws. Ejector Arm still holds finished shaft.

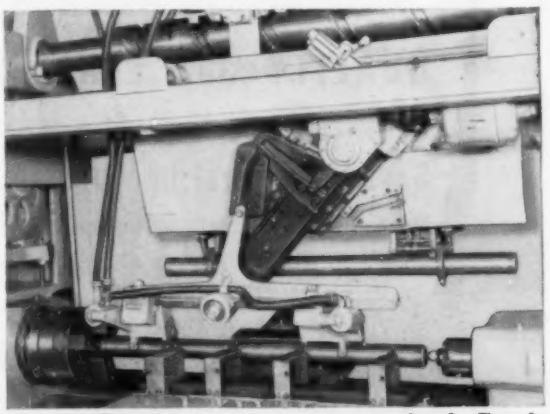

Fig. 4...Injector Arm movement completed. Rough shaft on centers, chuck jaws closed and tailstock spindle advanced. Injector Arm Fingers will next release shaft, and machining begins while Trolley discharges finished piece and returns with the next rough shaft.

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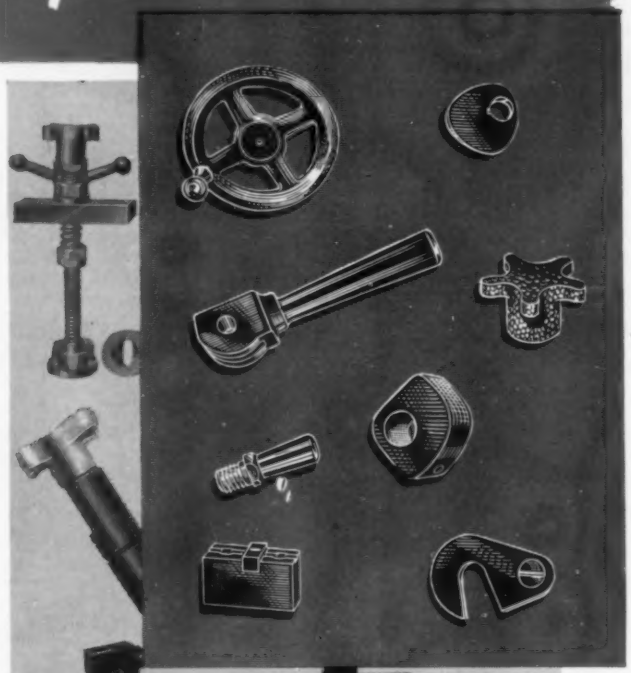

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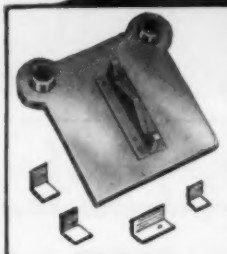

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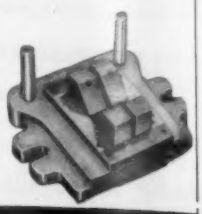

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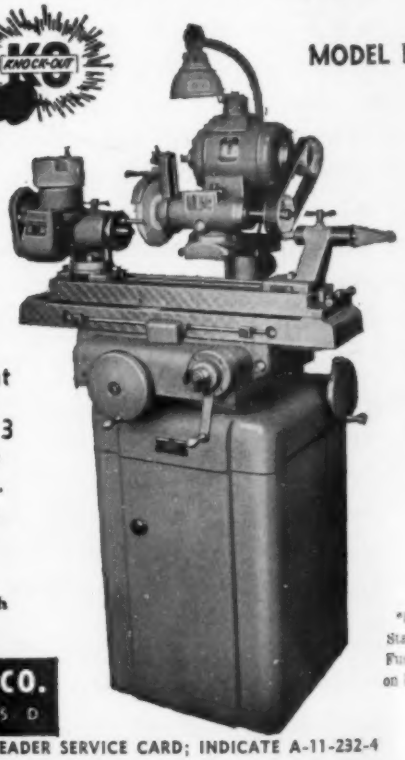

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I-3

A mule is a hybrid

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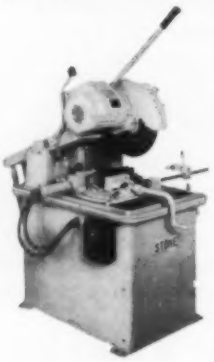

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Full 7½ h.p. geared-in-head motor. Will cut all ferrous and non-ferrous solids up to 2½", pipe and structurals up to 4". Can be equipped for wet cutting.

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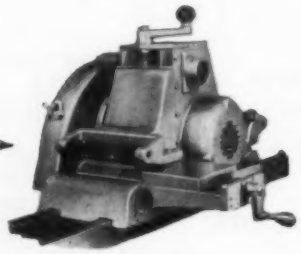
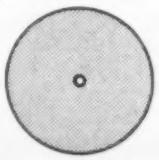
Operates on guided rails for cutting larger structural steel, plate, sheets, with cuts up to nine feet in length. Cuts wet or dry.





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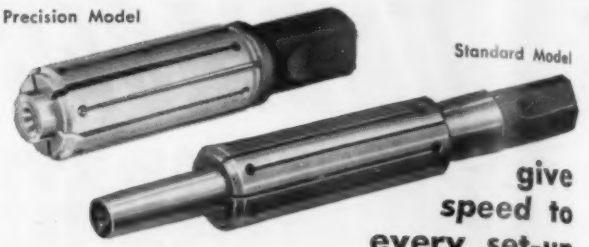
Precision Model



Standard Model

give speed to every set-up

The flexible sleeve, mounted on tapered arbor, expands automatically to fit the hole. Inserted by hand — no arbor press needed. Always an exact, positive, concentric fit. Locked by a single mallet blow. Unlocked the same way. CHAMPION Expanding Mandrels are used in machine shops around the world. Save time, cut production costs, whether the job calls for machining one piece or a thousand.

Precision Model has expansion range of .010". Available in regular sizes to fit holes from ½" to 3" diam. Holds work to tolerances of .0002" run-out. Guaranteed for precision grinding, turning and milling operations.

Standard Model maintains close tolerances, handles material of any length bore, hard or soft metals — from thin tubes and bushings to heavy castings and forgings. A set of fourteen will fit every hole from ½" to 9½" diam.

CHAMPION *Expanding Mandrels can be made in special shapes and sizes to fit any specifications. Quotations on request. Write for descriptive folder today.*

WESTERN TOOL & MFG. CO., INC.
Dept. 23 Springfield, Ohio

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ACCURATE INSPECTION

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Surface Plates
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SPEEDS FROM 50-4500 S. F. M.

with the new

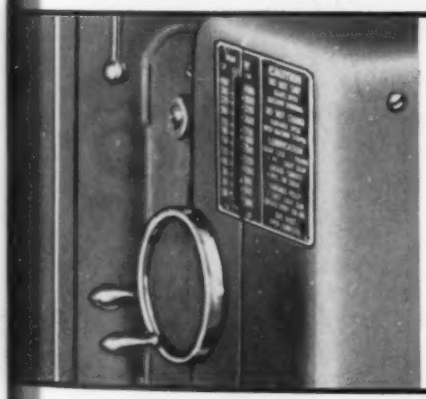
WALKER-TURNER 16" BAND SAW

You just dial the exact speed you want for a specific job — *while the machine is running.*

Newest of the Walker-Turner *light-heavyweights*, this 16" Band Saw features a Variable Speed Drive. Handles hundreds of cutting jobs — from tool steel to plastics — requiring varying rates of blade speeds. Infinitely variable speeds — from 50-4500 S.F.M. — are controlled by a hand wheel. No time "lost" changing belts or pulleys. Blade speeds are shown on a graduated scale.

In addition to the new Variable Speed Drive this new band saw features improved saw guides, quick change tires and an all new base. It's a versatile precision tool designed to set new performance records in your plant. Put it to work . . . and save.

For complete information on the new 16" Band Saw and other cost-cutting *light-heavyweights* call in your local factory-trained Walker-Turner distributor, or mail the coupon.



Quick-change Variable Speed Drive

A turn of the hand wheel gives the exact speed desired for any cutting job — from 50-4500 S.F.M. — while the saw is running. No "lost" time changing belts or pulleys.

Features that give you the most for your machine dollar!

CAPACITY: Blade to frame 16". Upper guide to table, max. 8".

SPEEDS: Infinitely variable, 50-4500 S.F.M.

FRAME: Three-piece frame and body construction for greater rigidity, accuracy and smoother operation.

BEARINGS: 6 Heavy duty precision ball bearings.

WHEELS: Dynamically balanced, rubber faced. Quick change tires standard equipment.

TABLE: Cast iron 18" x 17", carefully machined with $\frac{3}{4}$" x $\frac{3}{8}$" miter gauge slot. Tilts to 45°.

GUIDES: Improved upper and lower leaf-type with ball-bearing rollers.

GUARDS: Cast aluminum doors cover wheels. Blade fully protected.

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AUTOMATIC POWER FEED: For cutting straight or irregular pieces. Unique clutch mechanism prevents overloading, prolongs blade life.

WELDING UNIT: For blades to $\frac{1}{2}$" wide. Available for operation on 110 or 220 volt A.C. Self contained grinder for removing flash.

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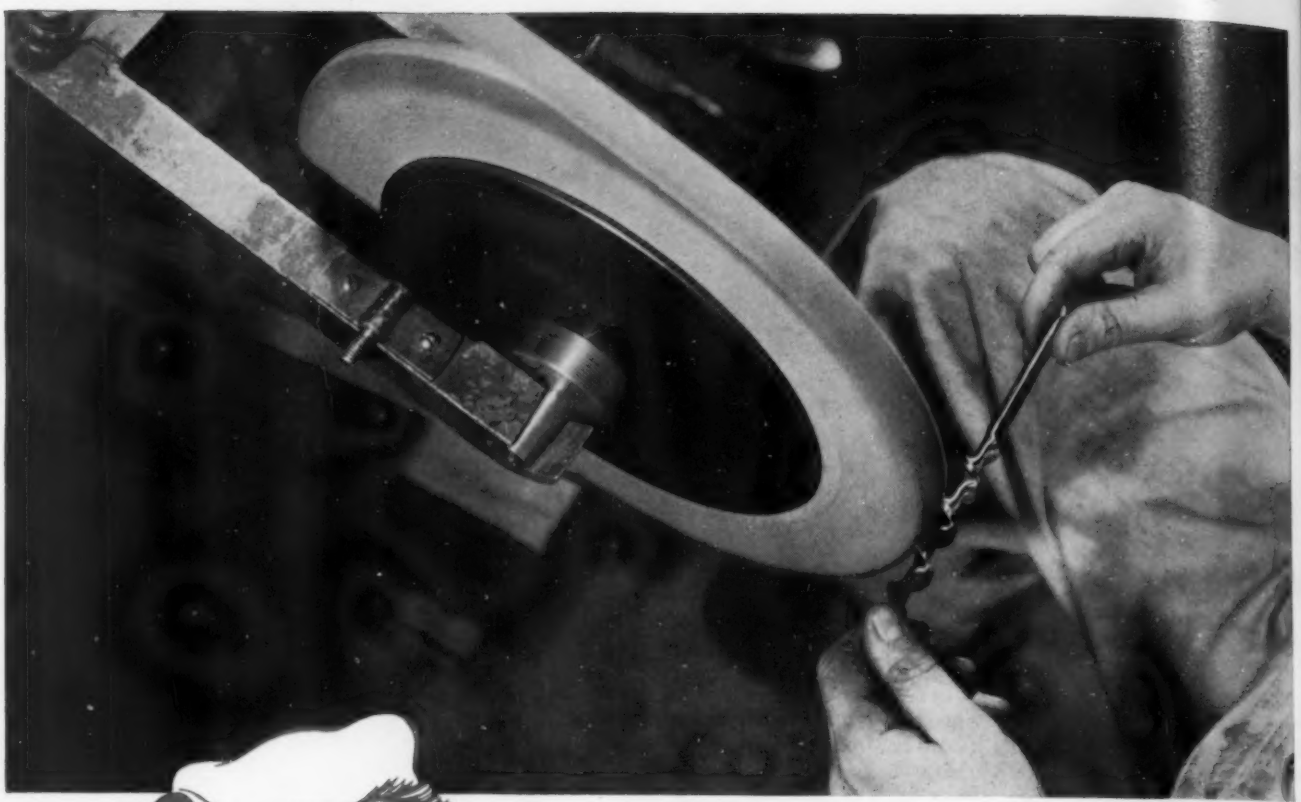

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You may hit it in one — then again you may make many tries for the most profitable polishing method, get only a mediocre result. Consider the many variables in this polishing game — here are some:

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19 Sizes of abrasive grain —
9 Types of belt —

Over 15 types of contact wheels and that's only part of it — right there, are over thousands of possible combinations. Why waste good production time on hit-or-miss research when Polisher Pete has already gone over the ground and has your answer ready for you?

Polisher Pete symbolizes the BEHR-MANNING® Engineering Application Department, and the staff of BEHR-MANNING Abrasive Engineers, with this polishing data right at their finger tips, is all set to cooperate. Even if you *know* you are getting best results, why not confirm it. Call in your local BEHR-MANNING Field Engineer and make a double-check.

For some pretty solid facts on polishing, write for the booklet, "How Polisher Pete Put Economy in Polishing." Behr-Manning Corp., Troy, N. Y., Dept. TE-11.

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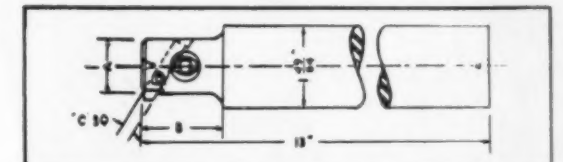
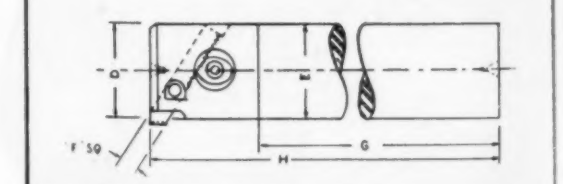


Tool No.	A	B	C	Boring Range
123	1"	1½"	¼"	1¼" To 1⅓" Dia.
121	1¼"	2"	5/16"	1½" To 2" Dia.



Tool No.	D	E	F	G	H	Boring Range
118	1¾"		⅜"	12¼"	14¼"	2" To 2⅝" Dia.
116	2¼"	"D"	½"	14½"	17"	2⅝" To 3¼" Dia.
114	2¾"	Plus	⅝"	16"	19"	3⅛" To 4⅛" Dia.
111	3½"	1/64"	¾"	8½"	12"	4⅛" To 5¼" Dia.
107	4½"		1"	7"	12½"	5¼" To 7" Dia.

If Davis can't bore it — it can't be done

DAVIS BORING TOOL DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY

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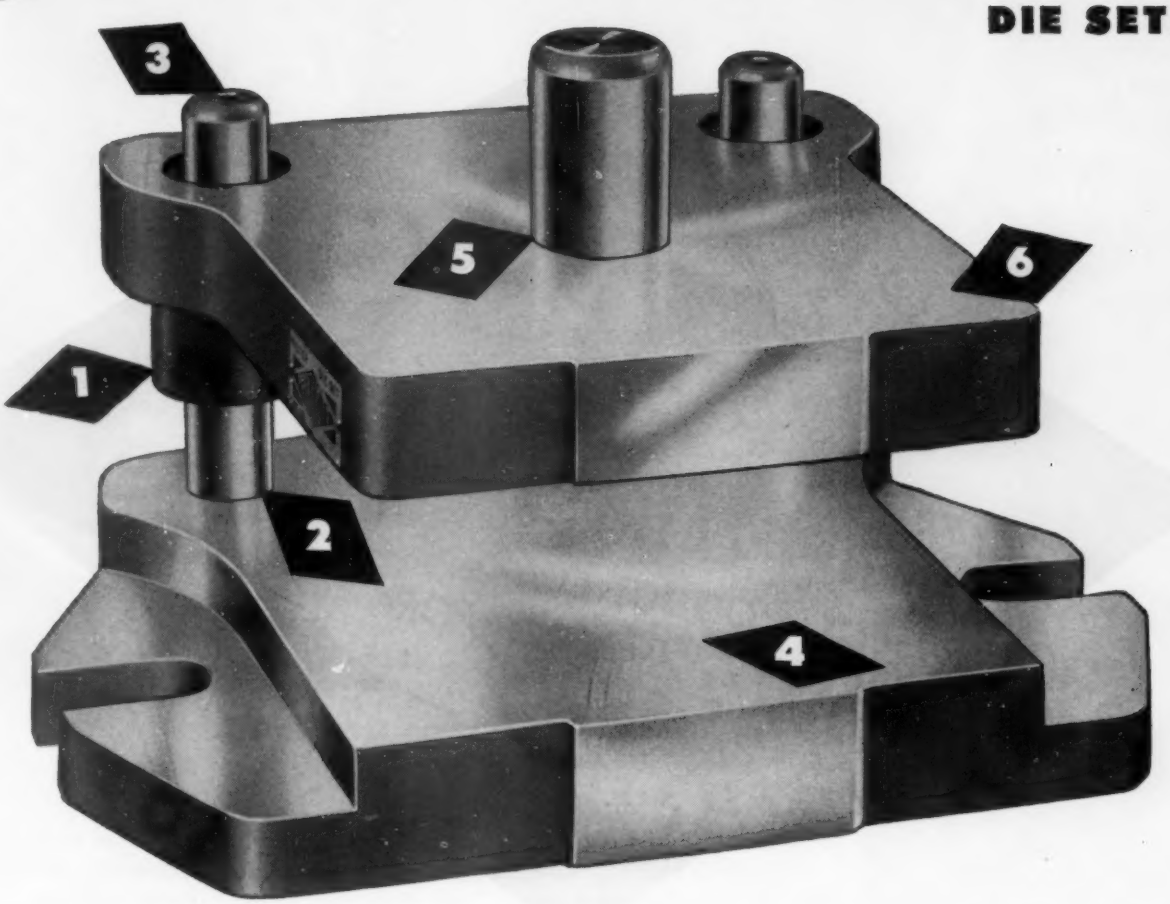
Builders of plain and micrometer adjustable block type boring tools; line boring bars; special boring tools; car boring tools; planer, vertical boring and turning mill tools; Quick Change arbors and sleeves.

6 reasons for buying.. PRODUCTO DIE SETS



1. Bushings have an absolutely **uniform** inside diameter, resulting in **full-bearing** and **extra long life.**

2. New design die set gives added **strength** and assures **accurate location** of pin and bushing holes.

3. **Accuracy** of guide pins and bushings are **checked** on **light guages** reading to 50 millionths of an inch.

4. **Parallelism** and **flatness** held to **close limits** by rough machining prior to grinding.

5. **Shank,** cast as integral part of semi-steel die set, can be **inserted** or **welded** on all-steel sets.

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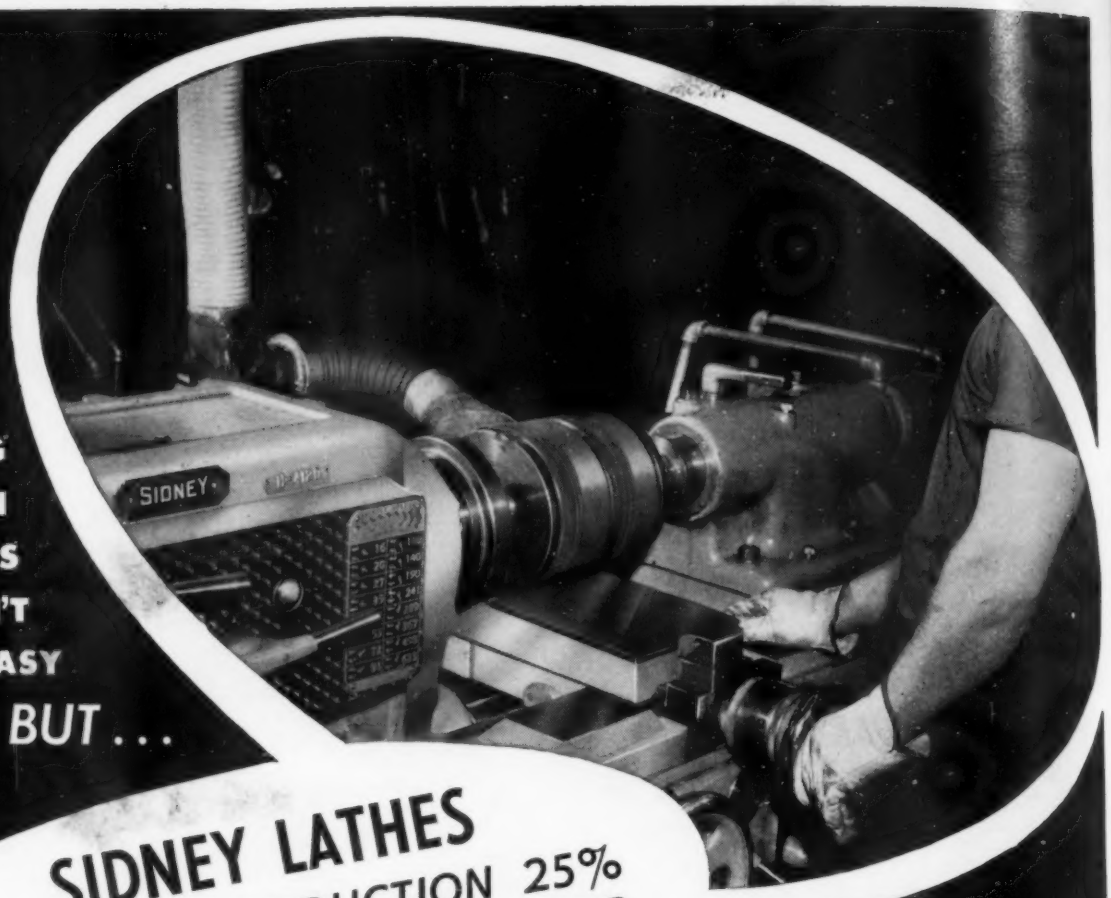
ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY.

FORM TURNING PISTON RINGS ISN'T EASY BUT . . .



SIDNEY LATHES

INCREASED PRODUCTION 25% AND IMPROVED QUALITY FOR PERFECT CIRCLE

When you consider the millions and millions of piston rings produced by PERFECT CIRCLE you can understand what a 25% increase can mean in the total output. And think also of the infinite precision necessary to achieve the required smoothness on which so much depends.

SIDNEY LATHE'S HERRINGBONE GEARS ELIMINATE TOOTH MARKS

Here's What PERFECT CIRCLE says about SIDNEY LATHES:

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Write for details or contact nearest Sidney representative

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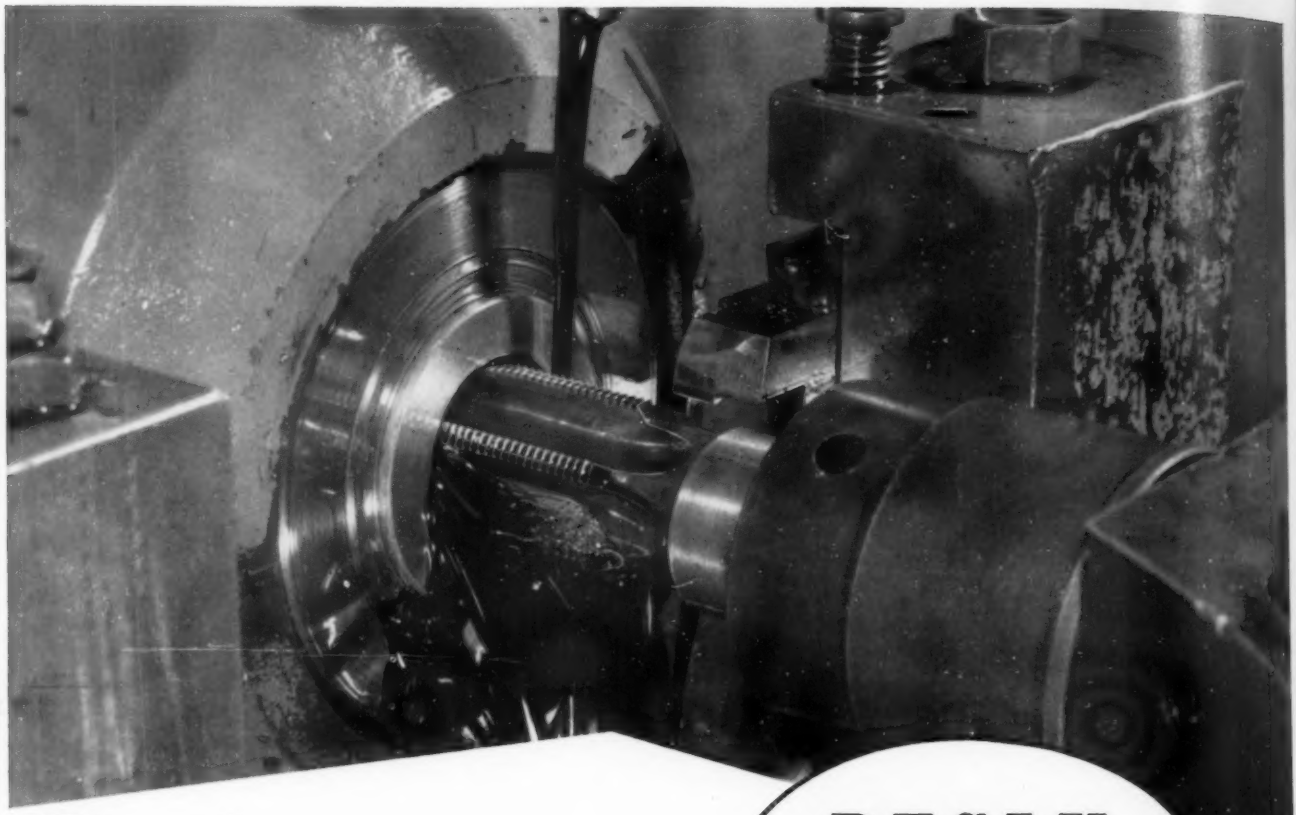

Doing a Tough Job Well for The Chicago Screw Company

BESLY TAPS

HERE you see a C-1018 high carbon steel nut being threaded by a Besly 1¾" —12 tap. Highly abrasive because it has been carburized and heat treated, the material is hard on taps. For this reason, The Chicago Screw Company chose Besly Taps . . . the line of taps that *has proven* it can "take it" on the toughest of jobs.

LET US PROVE that Besly can help you get better threaded parts, longer tap life and lower tapping costs on *your* tough jobs. Ask us or your authorized Besly distributor for a FREE TRIAL RUN on your toughest jobs . . . PLUS details on Besly's Super-Service on "Specials".

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TAP TIPS The handy "Handbook for Tap Users" is full of information on tapping methods and tap selection. WRITE FOR YOUR FREE COPY.

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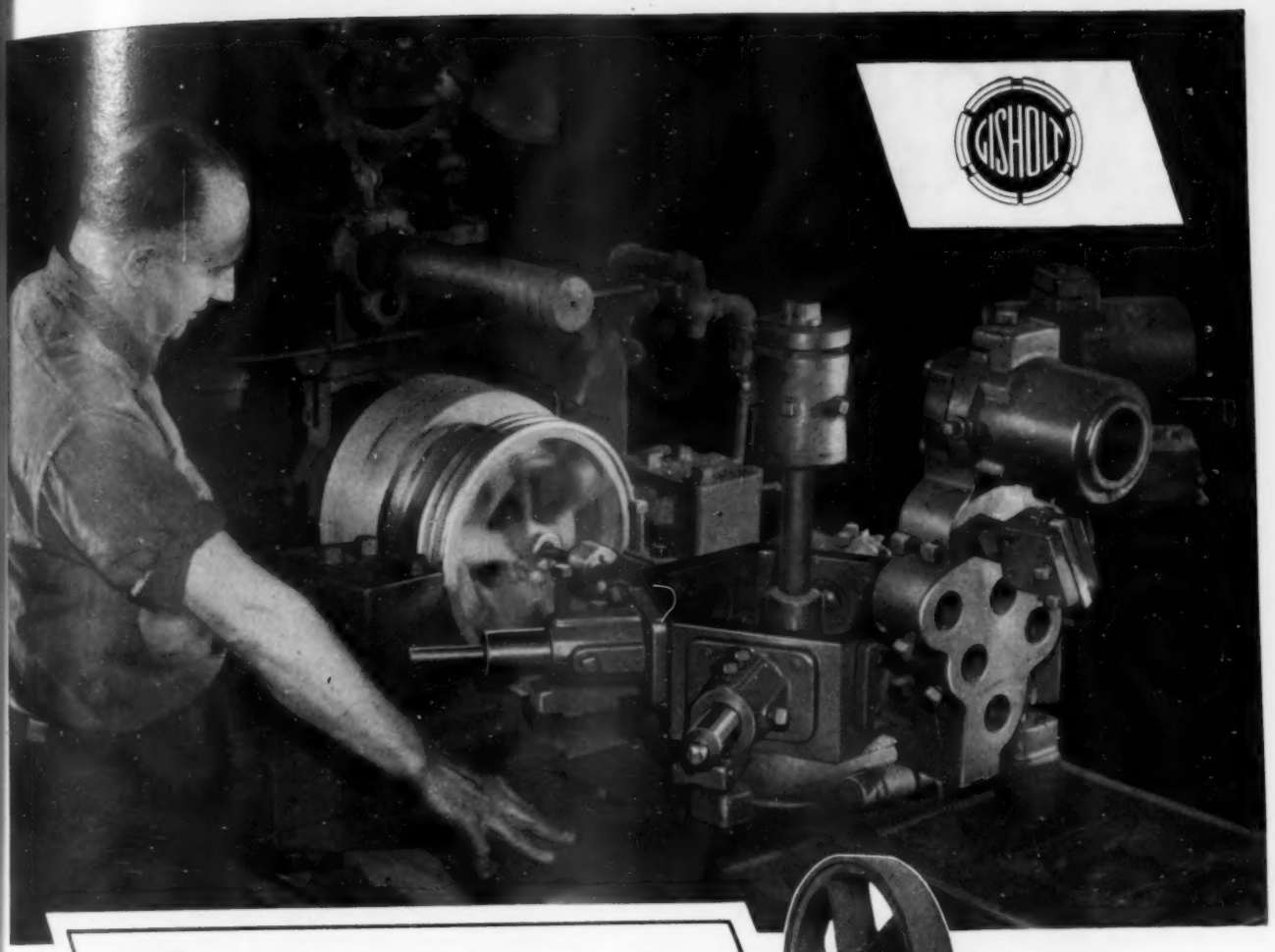


Production Trebled by the *FASTERMATIC!*

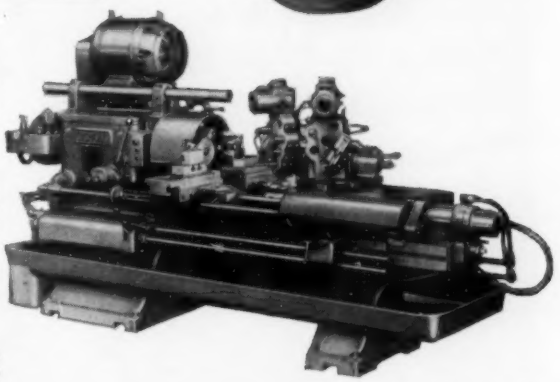
Rough Casting *Finished Sheave*

Note here the rather simple tooling arrangement for machining cast iron sheaves. This setup, similar to regular turret lathe work, is made just as easily. But here, the machine performs 15 different operations—holds tolerances consistently—completes the entire machining job in 13 minutes. The former time was 39 minutes.

Completely Automatic Cycle

It's the swift, automatic cycle of the Fastermatic that accounts for such substantial time savings. With its hydraulic feed system and automatic speed control, the operator has only to load the chuck, start the machine and remove the finished work. Usually, the operator has time to tend a second machine.

Now, when you need still greater production, it is a good time to look into the Fastermatics. Write for the Fastermatic catalog.



The Fastermatics are universal automatic turret lathes. Designed for accurate, high production turning, they can also be economically used on comparatively small lot work.

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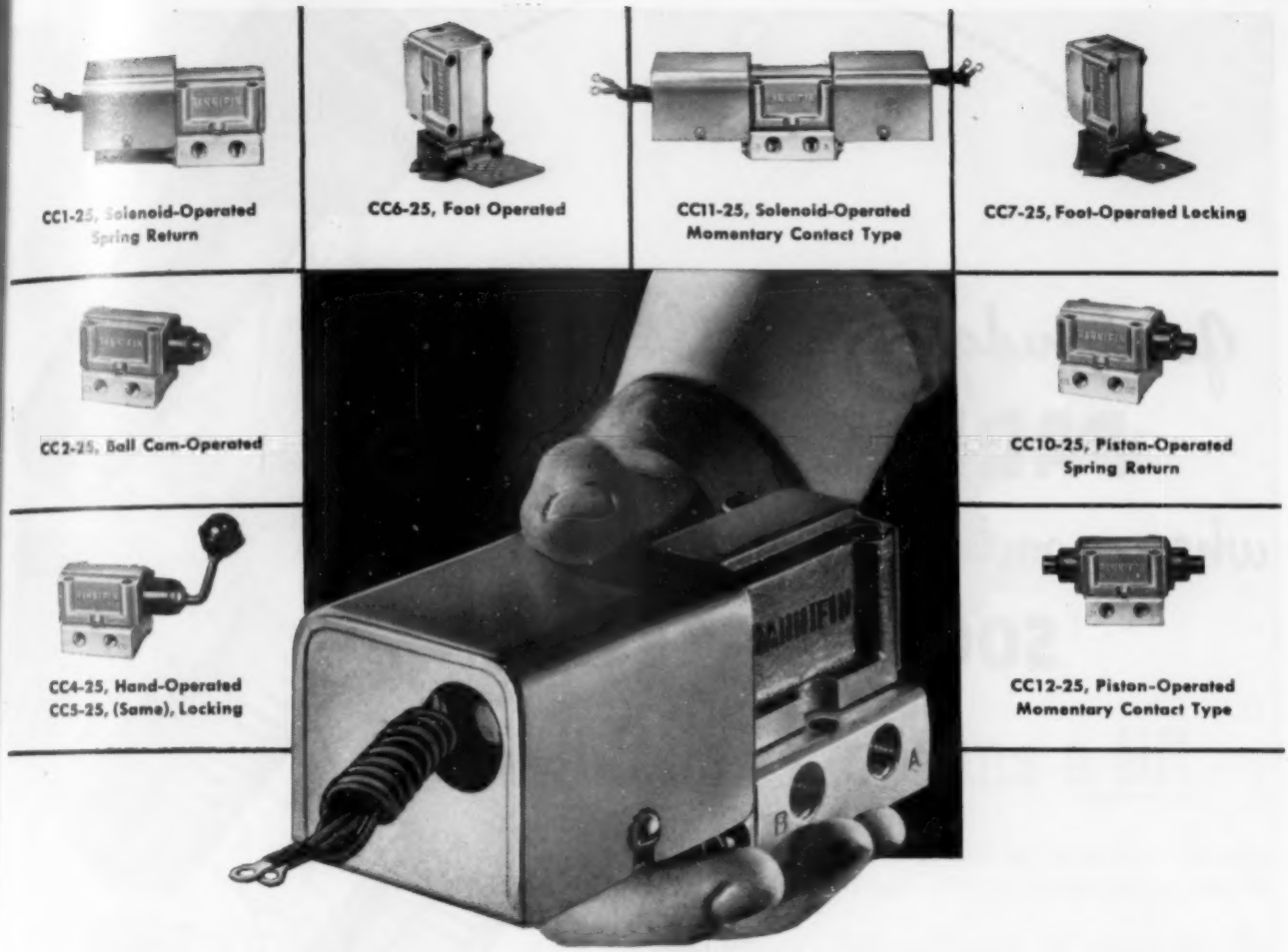

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more compact, less expensive than any similar valves

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GET THE COMPLETE HANNIFIN "P-M" AIR CONTROL VALVE CATALOG

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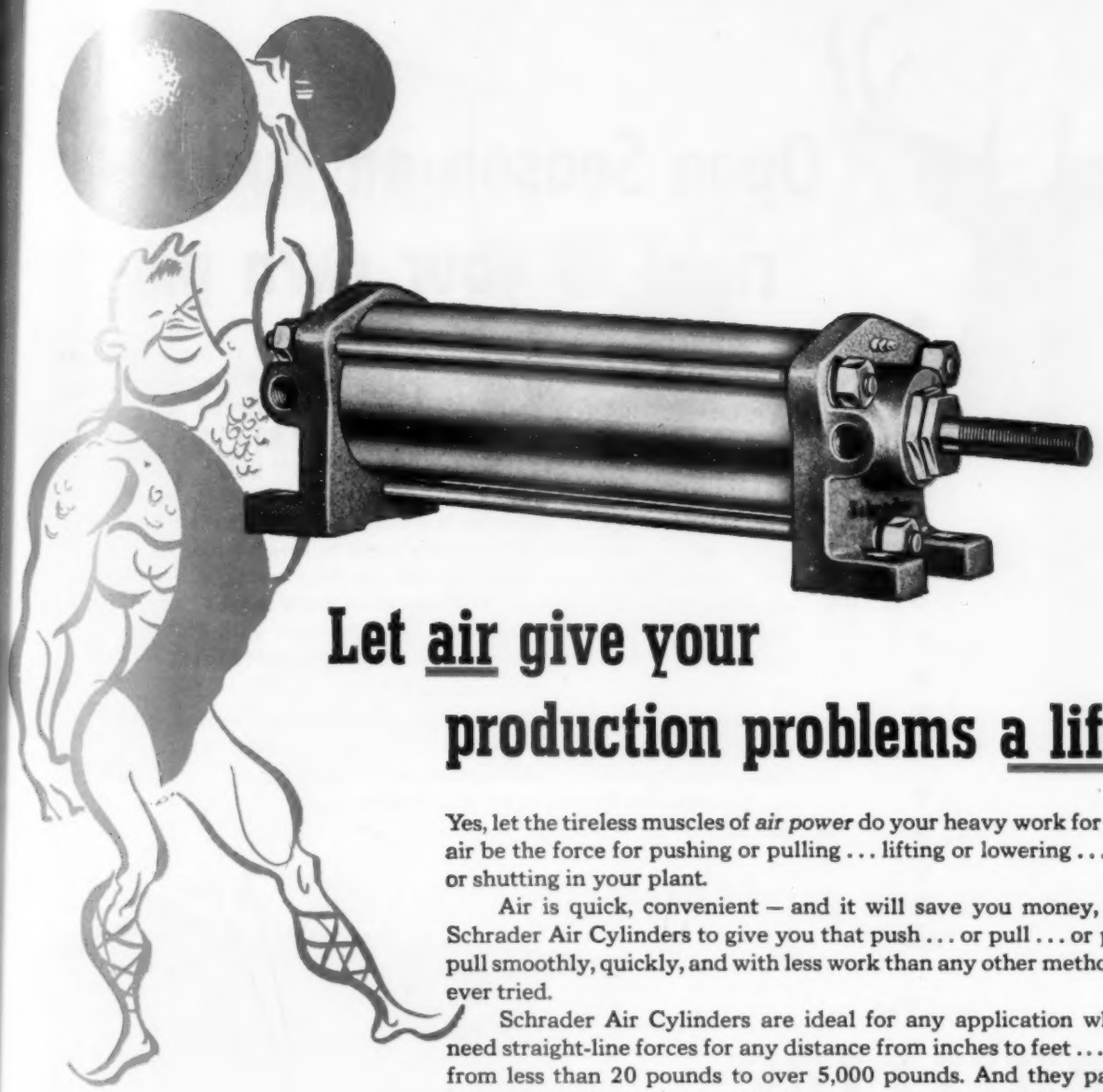

Let air give your production problems a lift

Yes, let the tireless muscles of *air power* do your heavy work for you—let air be the force for pushing or pulling . . . lifting or lowering . . . opening or shutting in your plant.

Air is quick, convenient – and it will save you money, too. Try Schrader Air Cylinders to give you that push . . . or pull . . . or push *and* pull smoothly, quickly, and with less work than any other method you've ever tried.

Schrader Air Cylinders are ideal for any application where you need straight-line forces for any distance from inches to feet . . . at forces from less than 20 pounds to over 5,000 pounds. And they pack more power for their size and weight than any other commonly used type of power unit.

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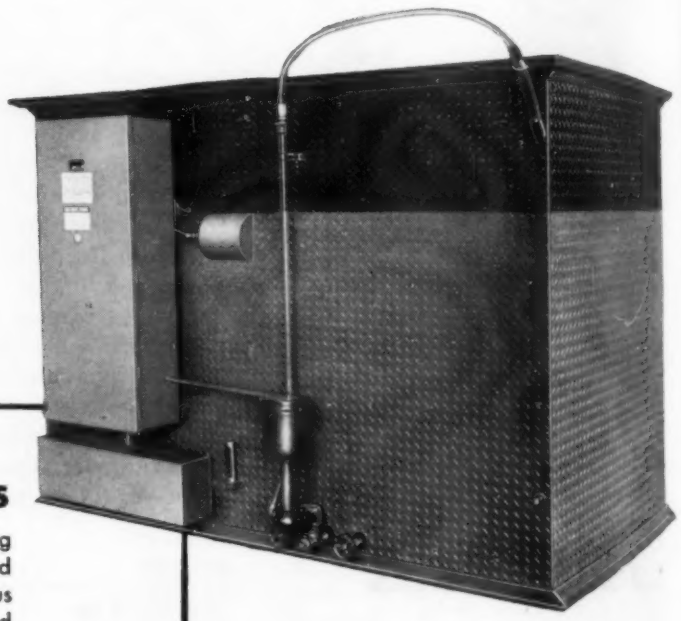

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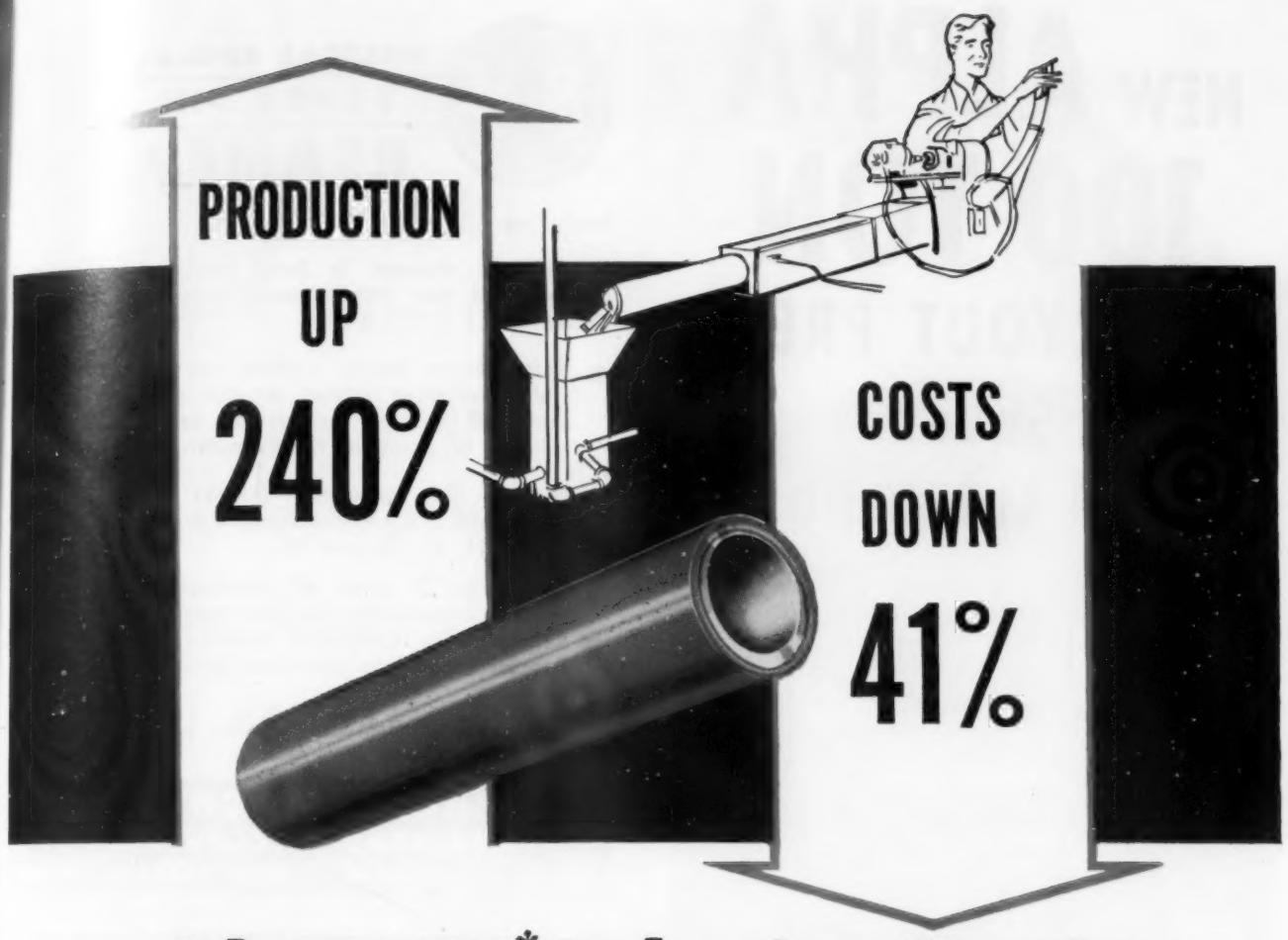
ENGINEERED METAL CLEANING EQUIPMENT

ALPHA



with TOCCO* Induction Heating

Whether you're interested in upping production or downing costs—or both—it pays to investigate TOCCO Induction Heating if you heat-treat, anneal, braze, solder, forge or melt ferrous or non-ferrous metal parts.

PRODUCTION UP—When Thompson Products Ltd., St. Catharines, Ontario switched from conventional methods to TOCCO Induction Hardening of their automotive wrist pins, production rose from 500 to 1200 per hour.

COSTS DOWN—While production jumped, costs fell from $5.46 per hundred parts to $3.23—a savings of more than 2c per pin or $26.76 per hour on the hardening operation alone.

OTHER ADVANTAGES—Additional savings result from elimination of hauling wrist pins to and from the heat-treat department. Cool, clean TOCCO fits right in the production line, next to related operations—takes only ¼ the space of the pusher-type furnace previously used.

In Canada or the United States TOCCO engineers are glad to survey your operations for similar cost-cutting results—no obligation, of course.

THE OHIO CRANKSHAFT COMPANY

TOCCO

*Trade Mark Reg. U. S. Pat. Off.

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. G-11, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating".

Name_____

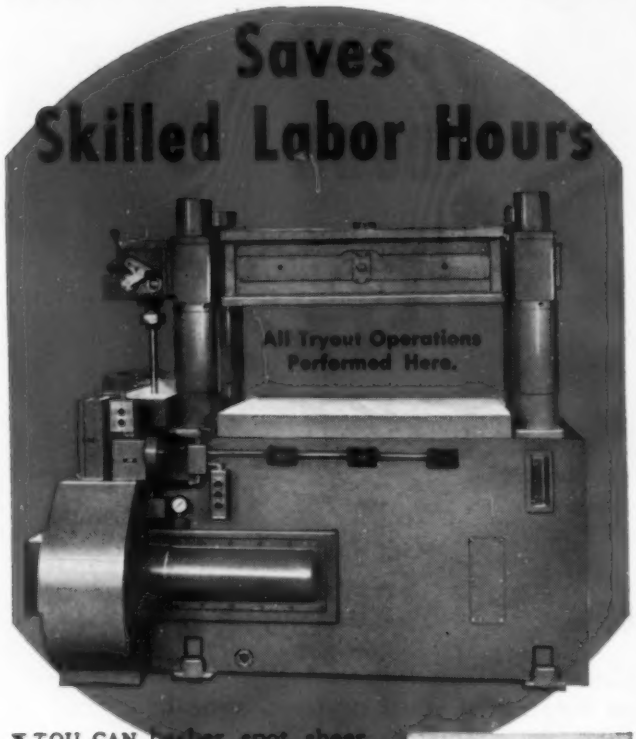
Position_____

Company_____

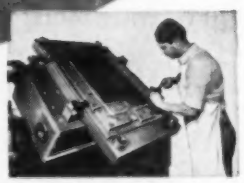
Address_____

City_____ Zone____ State____

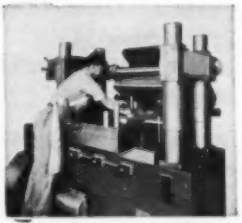
NEW ALPHA 100 TON DIE TRYOUT PRESS



YOU CAN bender, spot, shear, fit and finish both die and punch **WITHOUT REMOVING** the DIE. "Tryouts" take less time because the press is open on all four sides, giving easy access to the die and punch. The head can be quickly released and rotated to any point up to 240°. This new press is compact, being 82" high and occupying only 75" x 84" of floor space. The rugged construction of the Alpha 100-ton die tryout press assures years of trouble-free service.



The top die in position for altering.



It's easy to work on the bottom die.

Send today for your free folder. It gives all the details about this remarkable press.

ALPHA TOOL WORKS
9281 Freeland Ave.
Detroit 28, Mich.

USE READER SERVICE CARD; INDICATE A-11-250-1

Buol

HELICAL SPIRAL TAPER PIN REAMER

featuring

Continuous change in lead angle to compensate for continuous change in diameter.

- This feature insures uniform depth of radial undercut (shear) on the entire length of the taper and provides uniform relief at all points on the diameter.
- In stock for immediate delivery sizes #6/0 thru #10. Made promptly to order sizes #11, 12, 13, and 14.
- Backed by 27 years of manufacturing reamers exclusively. We also make Stub Reamers, Die Clearance Reamers, and Special Reamers to your exact specifications.

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REAMERS EXCLUSIVELY
PARK & MEADOW NEW BRITAIN, CONN.

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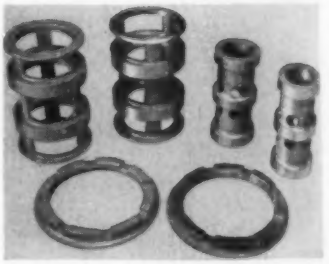
Pressure Blast Application #601

Pressure Blasting has eliminated over-staffed "hand burring benches" in thousands of plants. Costly and slow hand burring methods were forcing costs up on this typical group of parts until Pressure Blasting was introduced. Burring time on the two components to the left was reduced from 9 minutes to 25 seconds . . . on the pair to the right from 6½ minutes to 20 seconds . . . on the pair in the foreground from 7 minutes to 20 seconds. No stock removal . . . no etching!



ONLY PRESSURE BLAST GIVES YOU 2-SPEED WET-BLASTING

FREE . . . Learn what PRESSURE BLAST can do for you! Die and Mold Polishing, Blending Grind Lines, Deburring, Heat Treat Scale Removal, Honing of Cutting Tools, Pre-plating Cleaning . . . Hundreds of proven, money-saving applications!

Write for our new 8 page fully illustrated Booklet . . . or send samples of work you want tested to:

MODEL A . . . ONE OF 4 STANDARD UNITS. CUSTOM MACHINES DESIGNED TO FIT SPECIAL REQUIREMENTS.

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747-9 Windsor Street
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USE READER SERVICE CARD; INDICATE A-11-250-3

eliminate the guesswork in selecting tool steels

1/3 actual size, Selector is in 3 colors

Thousands of metal working people are using the Crucible Tool Steel Selector to determine exactly which type of steel they need. This handy selector covers 22 tool steels which fit 98% of all tool steel applications.

The selector is unique because it starts with the ultimate use of the steel. It breaks down all tool steel applications into six major classifications, under which the different grades of steel available for certain specific requirements are indicated in legible cutouts. Heat treatment and machinability data are also included for each grade.

A flip of the dial will give you the answer, and almost just as quickly you can get the steel you select. For each type of steel shown on the selector is in stock in Crucible warehouses, conveniently located throughout the country.

To get your Selector merely fill in the coupon and mail. There is no obligation whatsoever.

HERE'S AN EXAMPLE:

Application — Deep drawing die for steel

Major Class — Metal Forming — Cold

Sub-Group — Special Purpose

Tool Characteristics — Wear Resistance

Tool Steel — Airdi 150

A turn of the dial does it! And you're sure you're right

Crucible Steel Company of America
Dept. T, Oliver Building,
Pittsburgh, Pa.

Name_____

Company_____ Title_____

Address_____ City_____ State_____

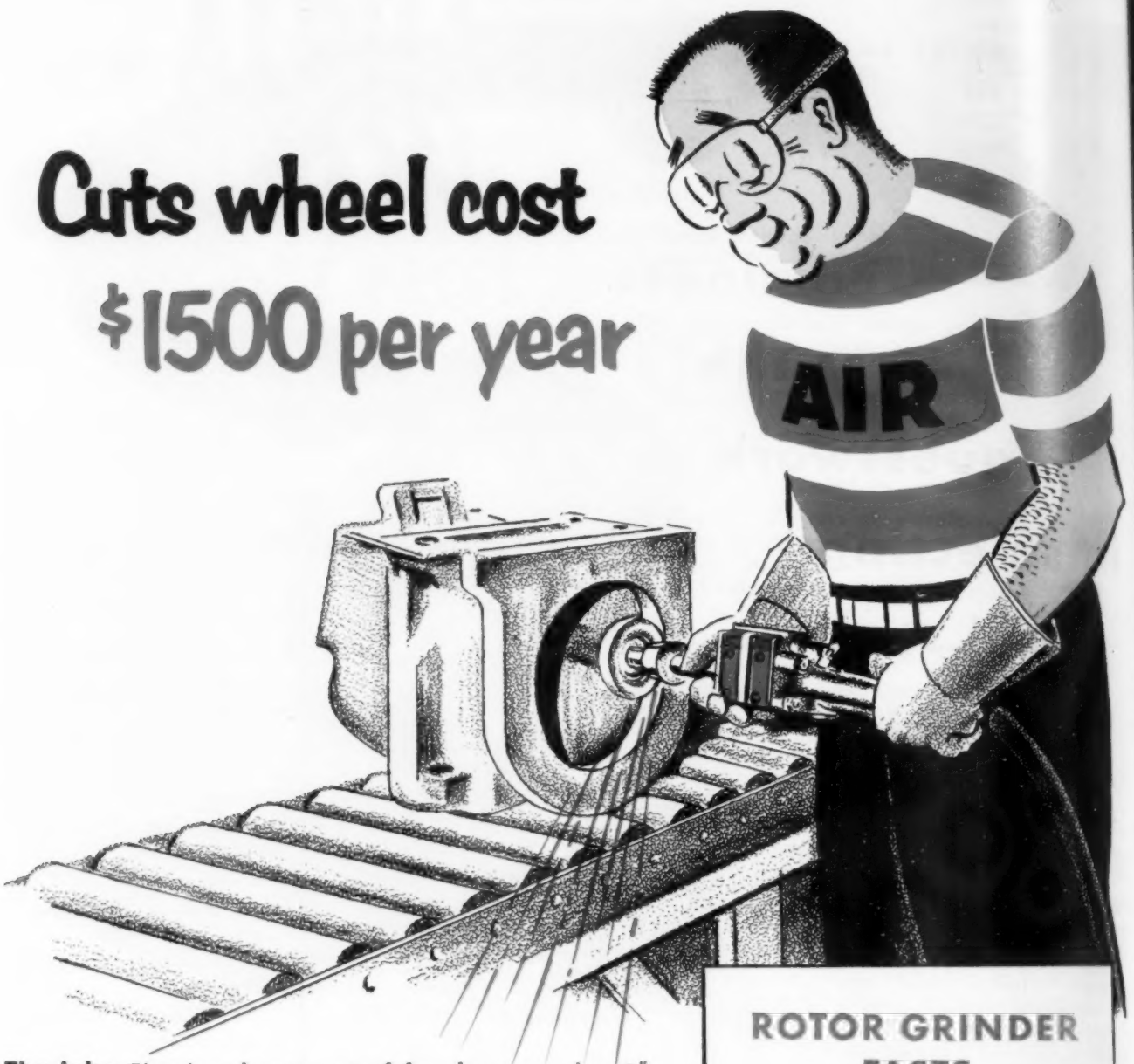
CRUCIBLE first name in special purpose steels

53 years of Fine steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.

Cuts wheel cost $1500 per year



The job: Cleaning department of foundry was using 8″ wheels with 4500 rpm grinders. When worn down to 5″ or 6″, wheels lost surface speed and metal removal dropped off. Wheels were laid aside or thrown away at this point.

Solution: Rotor Analyst suggested use of two Rotor 6000 rpm air grinders to use up discarded stub wheels.

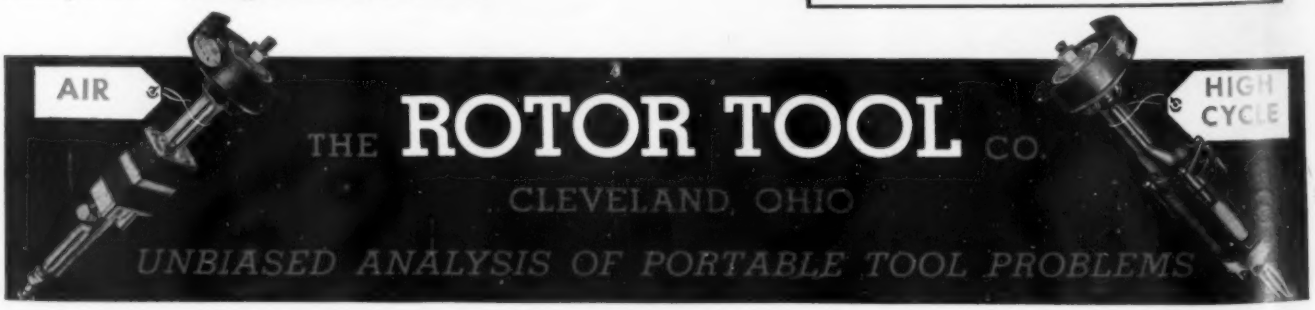
Results: Investment of $400 in new Rotor Grinders saves $1500 yearly in wheel costs.

How much will this idea save in *your* plant? Ask your Rotor Analyst for a trial grinder to find out!

ROTOR GRINDER FACTS

Rotor D125—6000 rpm—9¾ lbs.
Rotor D88—6000 rpm—9 lbs.

Others from 3100 to 20,000 rpm. Straight or spade handles. Ask for Catalog No. 38.



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PRECISION BORING MACHINES

SIMPLEX 2U-Single End Unit Type Precision Boring Machine with two #3 SIMPLEX Boring Heads. Large work table area allows sufficient space for fixture mounting. Other sizes of Mechanical and Unit Type Hydraulic Machines also available.

SIMPLEX MACHINE TOOL CORPORATION

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MILWAUKEE, WISCONSIN

PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES
SPECIAL DRILLING, TAPPING AND BORING MACHINES

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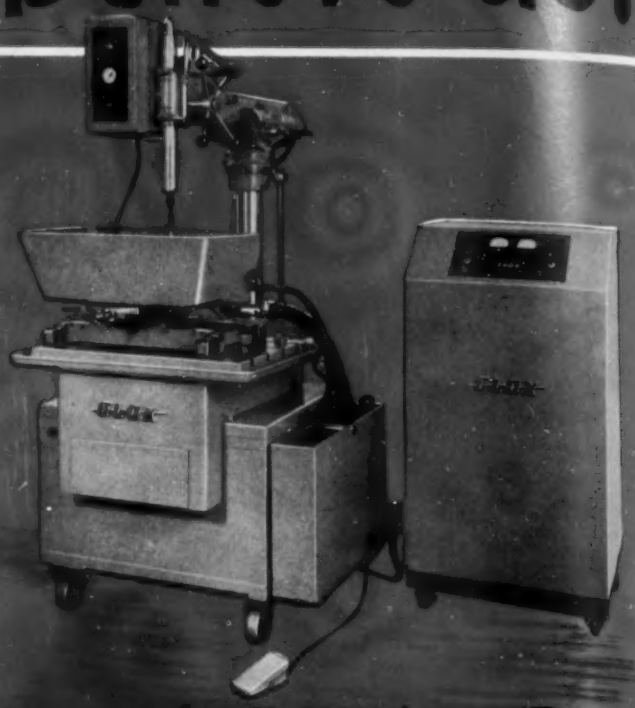
Will You Believe Us!



For over a month now top men in the metalworking industry have been coming to Detroit to watch the most amazing performance of a precision machine tool. Shown by appointment only, the new Elox M-400 Electronic Type Machine tool has reached into the future and revolutionized precision hard metal machining. Secretly shop-tested for over a year by exacting people in the tool and die industry, the powerful M-400 has produced hundreds of machining jobs heretofore considered impossible or impractical cost-wise. Its speed, surface finishes, unusual applications have astounded the most skeptical.

The M-400 may be seen in operation by appointment only at Elox Show Rooms—10231 Puritan, Detroit

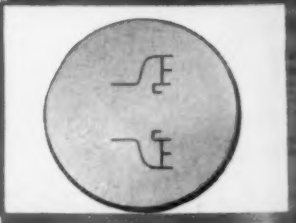
INTERESTED IN A $1,000???

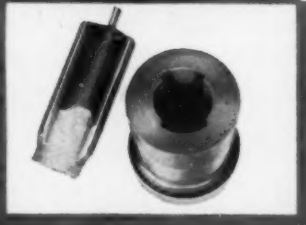
We made the machine, we've see it produce beyond our expectations but we don't know what to call it! Give us your suggestions for a name . . . you win $500. Best applications . . . $500. This is a contest open to anyone except employees of Elox, its advertising agency or members of their families. Entries must be in by Dec. 1, 1953.

a few M-400 jobs

Stamping Die held to within .001" of electrode size proving any shaped hole drilled as easily as a round hole. A savings of $400 was realized thru use of the M-400.

Extrusion Die held to within .00[illegible] polishing stock on a side.





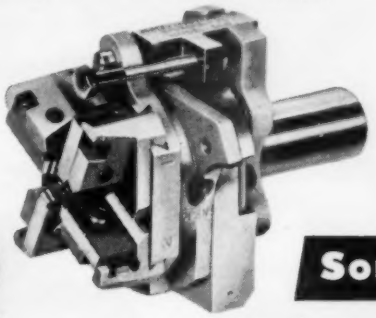
Powdered Metal Pressing Die finish machined by the M-400.

elox corporation of michigan

740 N. Rochester Road — Clawson, Michigan

JONES & LAMSON GUARANTEES CLASS III THREADS with REPETITIVE ACCURACY!

J & L Automatic Opening Die Heads are sold with this guarantee: that your threads will be held consistently within the exacting Class III tolerances for form, lead and pitch diameter, throughout the long life of the J & L chasers.



FOR BROWN & SHARPE AUTOMATICS and SMALL TURRET LATHES
Capacities from #0 to 1¼"

RADIAL CHASER TYPE
Capacities from #8 to 4¼"

TANGENT CHASER TYPES
Stationary and Revolving. Capacities from #4 to 2"

Some of the reasons why:

COMPACT, RUGGED DESIGN GIVES MAXIMUM SUPPORT TO THE CHASERS. J & L Dies are made of solid steel, no built-up sections, hardened and precision ground throughout. Chasers are supported at the point of, and in the direction of, maximum strain.

THREAD FORM, HELIX, PRECISION POINT HEIGHT, ARE ALL GROUND INTO CHASERS AFTER HARDENING. This gives you a freer cutting tool, operating with minimum wear and repetitive Class III accuracy. The high precision of the J & L chasers is maintained in the Die by exclusive chaser holding features.

EASY, CONTROLLED RESHARPENING. J & L chasers are resharpened independently of the holders or dies. Instructions are simple, easy to follow. Eliminates guesswork. Exclusive holding features assure accurate resetting.

P.S. *Only J & L Die Heads and Chasers give you ALL these features. Write to Dept. 710 for illustrated catalogs and complete information.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

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J&L DIE HEAD DIVISION

GORTON *Brings You* High Production

Automatic Profiling of CAMS AND CAM-LIKE SHAPES

Gorton Contour Mill, CM-12, Produces Extreme Accuracy and High-Surface Finish with Minimum Maintenance

This machine produces highly accurate, identical pieces — complicated cam shapes, external or internal, or continuous grooves and slots of irregular radii. The Gorton Contour Mill is easy to use and versatile — a simple tracer-controlled, vertical-head milling machine with two rotary power-driven tables. No complicated electronic, hydraulic or pneumatic controls.

CAPACITY . . .

Wide spindle-speed range — 300 rpm to 10,000 rpm — for either high-speed steel or carbide cutters, burrs or grit grinding wheels. The 16-inch master-copy table easily accommodates larger master cams. Several thin cams can be stacked and profiled at once.

EXTREME ACCURACY . . .

Operation depends upon a heavy, single-pivot beam which provides more accuracy than can be built into the tooling. A choice of several reduction ratios adds to accuracy and provides low micro-inch finishes. The reduction ratio principle produces piece parts to closer tolerances than those of the master.

CUSTOM-DESIGNED . . .

The basic machine is standard, but each mill is tooled for specific work. Because all machine elements are individually motor-driven, the machine can be adapted to a wide range of applications. Write for complete details and your copy of Special Bulletin 2380-C-2611.

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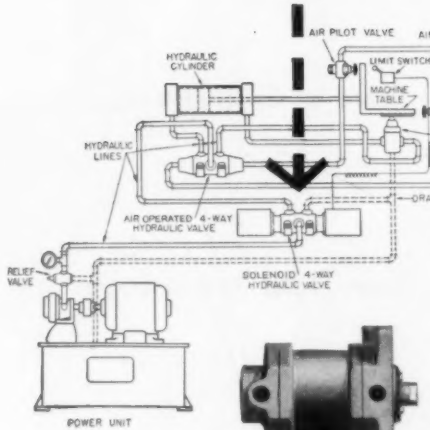
Push button production

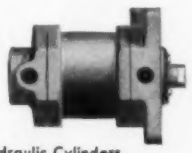
How near to its attainment are we?

Very near! In fact, it is on the doorstep of every manufacturer, awaiting his planning the application of lately designed sources of power to his production processes. Some companies already have their plants on a nearly automatic basis, and the resultant cut in costs quickly pays for their investment.

Rivett is playing a part in this manufacturing advancement. Its air and hydraulic valves and cylinders are ideal power replacements for untold manual operations. And, more important, they are being used to power entirely original processes—offering tremendous short cuts in machining, forming, handling, finishing, etc.

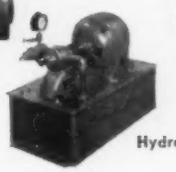
Remember, productivity is your sole source of success. Attain it! And the one best way is to follow the example of many progressive companies and plan the use of Rivett air and hydraulic power!





Hydraulic Cylinders
108 models

Hydraulic Valves
144 models



Hydraulic Power Units
17 models

Air Cylinders
84 models

Air Valves
34 models

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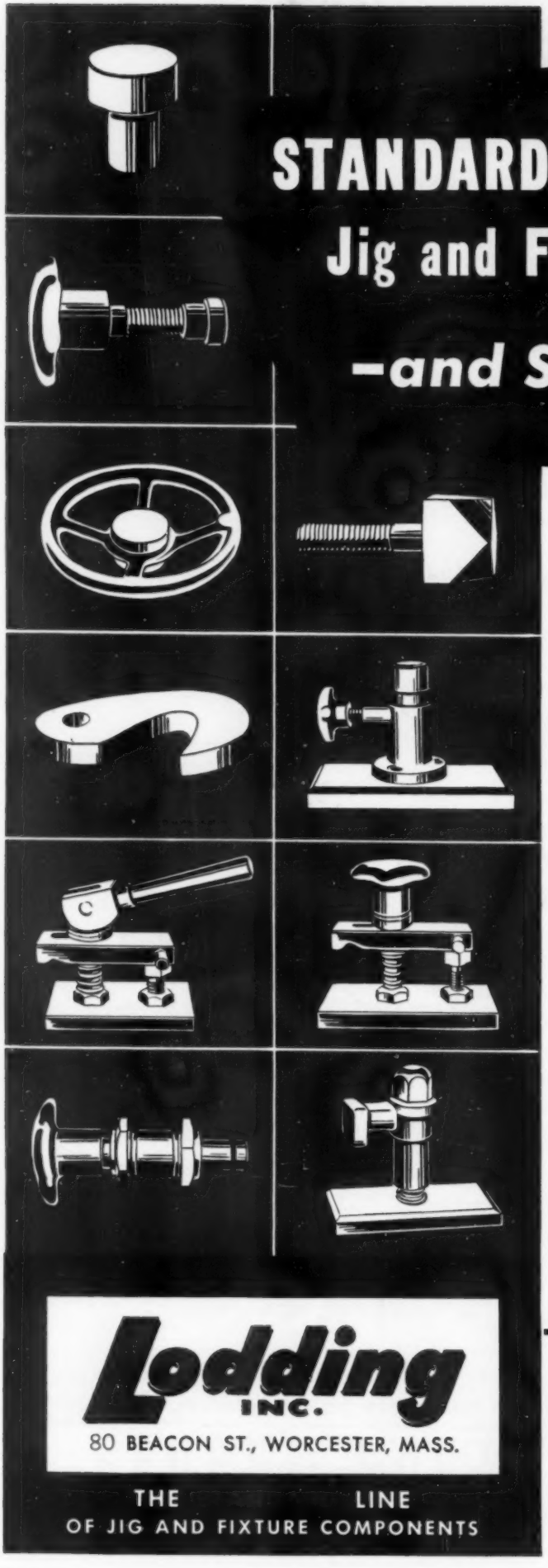
BIXI 60 COMBINATION HORIZONTAL BORING MILL AND JIG BORER WITH OPTICAL MICROSCOPES



STANDARDIZE with LODDING Jig and Fixture Components —and Save Ways!!!

Here's How:

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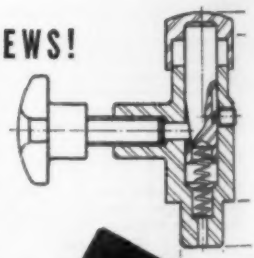
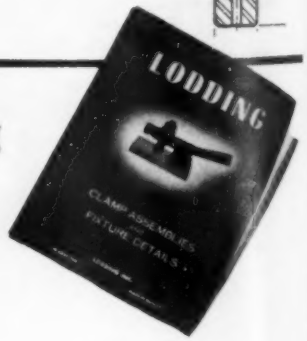
LODDING FIXTURE NEWS!

New Lodding Spring Jack records major savings. Ask for design details!



Write for Catalog

Contains full scale lay-outs of fixture details and clamp assemblies.



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80 BEACON ST., WORCESTER, MASS.

THE LINE OF JIG AND FIXTURE COMPONENTS

Surface Finish is

FOR FURTHER INFORMATION, USE READER SERVICE CARD, INDICATE A-11-53

DIXI 60

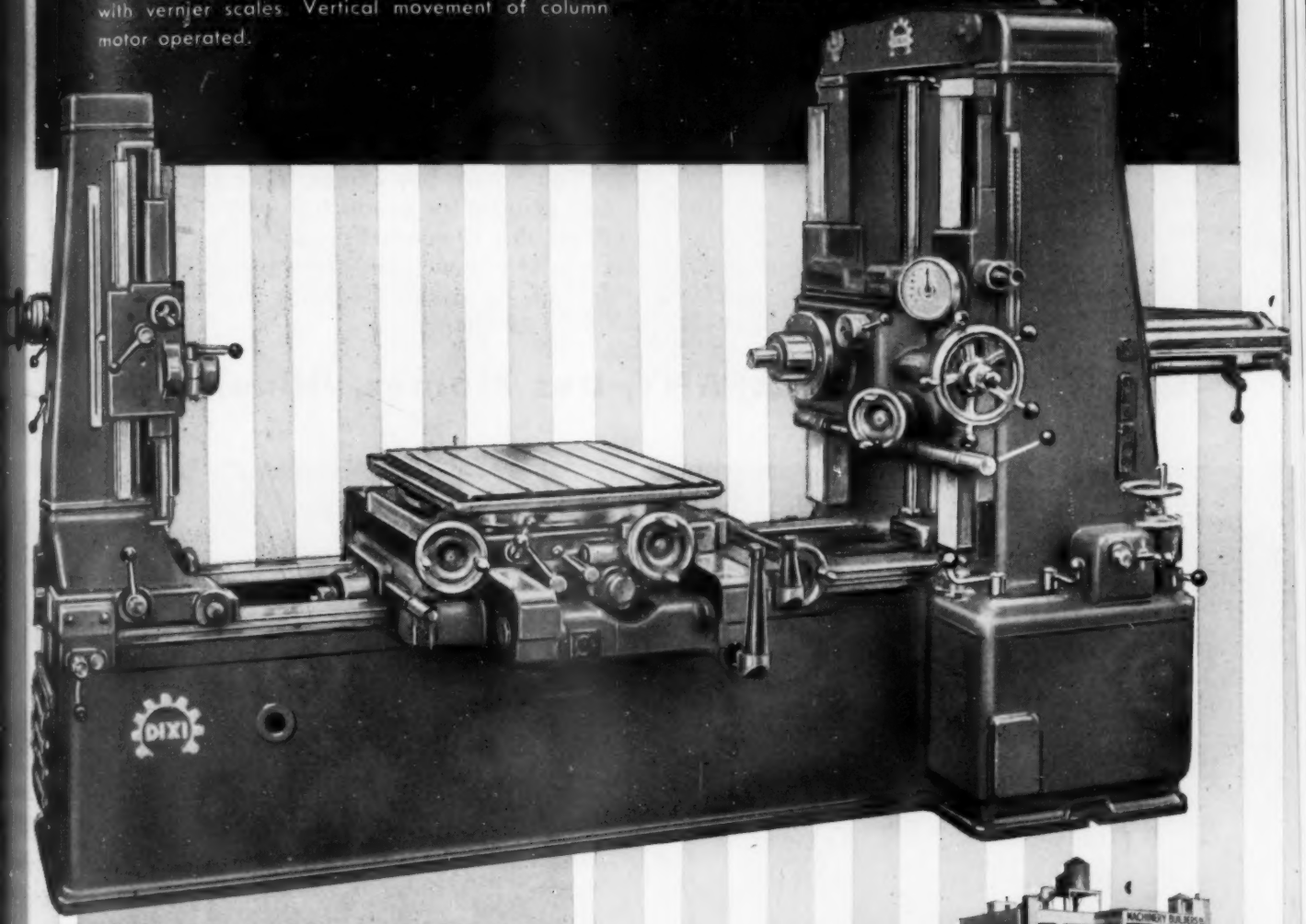
COMBINATION HORIZONTAL BORING MILL AND JIG BORER WITH OPTICAL MICROSCOPES

OUTSTANDING FEATURES:
A precision machine for drilling, boring, recessing, and milling work. Table can be rotated to 360 degrees. Accurate automatic locking of rotary table every 15 degrees, and at any other position by hand. Table and spindlehead have variable hydraulic feed. All coordinate dimensions can be set by dials, and adjustment made through optical microscopes. Mechanical spindle feed can be changed without stopping machine. Automatic stop of spindle feed. Optical measuring system operates in conjunction with vernier scales. Vertical movement of column motor operated.

DEALERSHIPS AVAILABLE

Over 20 years experience in designing and building machinery

ALSO EXCLUSIVE UNITED STATES DISTRIBUTORS OF LOW COST MULTI PURPOSE VISES • TAPPING ATTACHMENTS • QUICK CHANGE CHUCKS AND COLLETS • WILLE-GRIP KEYLESS DRILLCHUCKS MILLING MACHINE ARBORS, ADAPTERS, ARBOR SPACES AND BEARINGS • LATHE MANDRELS



Headstock, column, and table settings by optical microscopes to insure overall accuracy of .0002". Built in rotary table with optical microscope. Tables size 28¾" x 32⅝". Max. distance table to spindle 19.7". Table travel, 23⅝". Hydraulic feeds for all functions 0-78" per min. #40 Taper spindle. Spindle travel 24.4". Spindle speeds 32-1350 R.P.M. Feeds .0015"-.010" per rev.

- Guaranteed Service by Trained Staff
- Engineering Staff will make recommendations based on your requirements
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Write for free illustrated brochure 103, or state your specific requirements

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Surface Finish is

. . . when you buy a DoALL Precision Surface Grinder

WHEN you buy a DoALL Precision Surface Grinder, you receive a tag certifying the surface finish it will produce under normal shop conditions. No fancy lab tests, no special setups—just the routine inspection of the grinder as it comes off the assembly line. With the certification, you get the actual test block produced by your machine.

Every DoALL Surface Grinder is guaranteed to give you:

1. **Surface finish of 10 micro-inches RMS or better.** This is what any operator can get on your job. DoALL consistently produces 2 to 3 micro-inch finishes when grinding DoALL Gage Blocks prior to lapping.
2. **Flatness to .0002" over entire area of 108 sq. in. chuck.** This means flatness over any small area to within a few millionths of an inch.

You cannot buy a finer, more accurate surface grinder for production or toolroom use. Prove this to yourself by operating a DoALL Grinder at your plant. Simply call your local DoALL Store and ask for a free demonstration, or write:

THE DoALL COMPANY, Des Plaines, Illinois

FREE WHEEL BALANCER
with every grinder!

Only a perfect balanced wheel will produce a fine finish. This DoALL Wheel Balancer is the answer—simple, rugged and accurate. You pay nothing extra for it!

DoALL "Cool-Grinding" assures superior finish. Coolant flows *through* the wheel and out at point of contact with the work—permits heavy cuts without burning or checking.

Write for free illustrated brochure 103, or state your specific requirements

CABLE ADDRESS MACHBUILD, NEW YORK

Certified

Right — Profilometer analysis of test block shows surface finish produced on new DoALL Grinder.

Below — The test block and a surface finish certification tag accompany each new machine.

DoALL GRINDER

ACTUAL SURFACE FINISH TEST MADE ON YOUR NEW GRINDER SERIAL NO.

3953622

OPERATING CONDITIONS OF GRINDING ON ATTACHED TEST BLOCK FOR SURFACE FINISH SHOWN BELOW

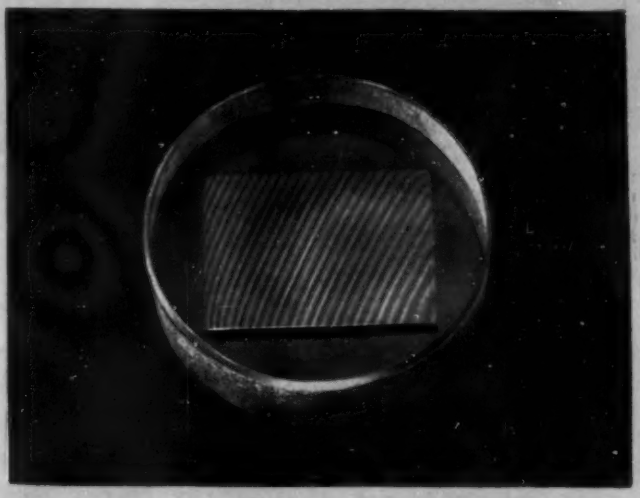
WHEEL SPEED 3500	DEPTH OF CUT .002
TABLE FEED 40'	MATERIAL Cold Roll
CROSS FEED .020	TYPE OF WHEEL 46J

THIS GRINDER PRODUCES A SURFACE FINISH OF 5 MICRO INCHES R.M.S. UNDER STANDARD OPERATING CONDITIONS AS DETERMINED ON TYPE Q PROFILOMETER.

DATE OF READING 9/10/53

INSPECTOR J.H.

BY



2 to 3 Micro-inch Surfaces Produced on Gage Blocks!

DoALL Grinders are actually capable of producing even finer finishes than those certified. Prior to final lapping, DoALL Blocks are ground to 2 to 3 micro-inch RMS surface finish on standard machines. Picture above shows block under optical flat. Surface was ground flat within 20 millionths.

DoALL

METALWORKING

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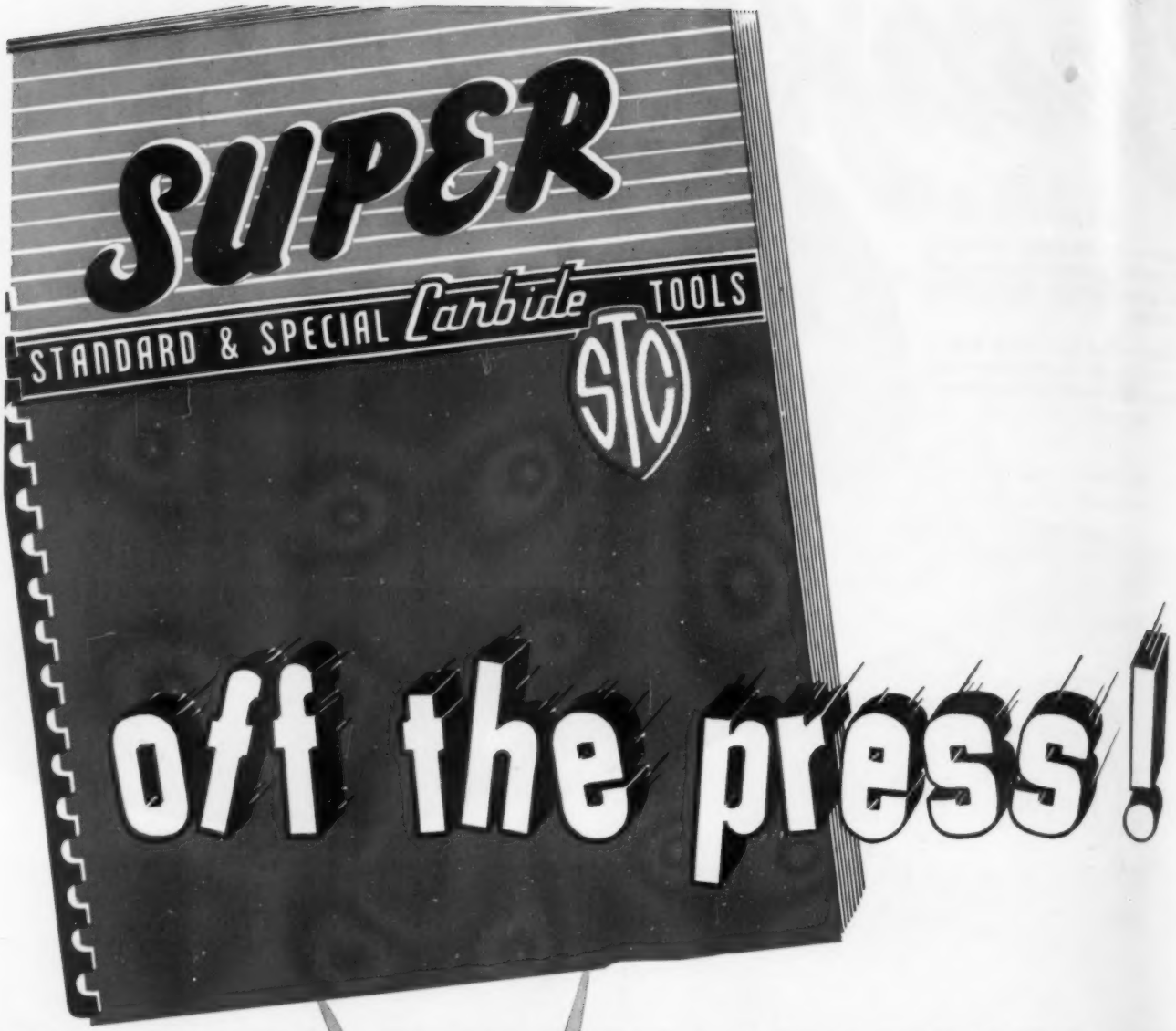

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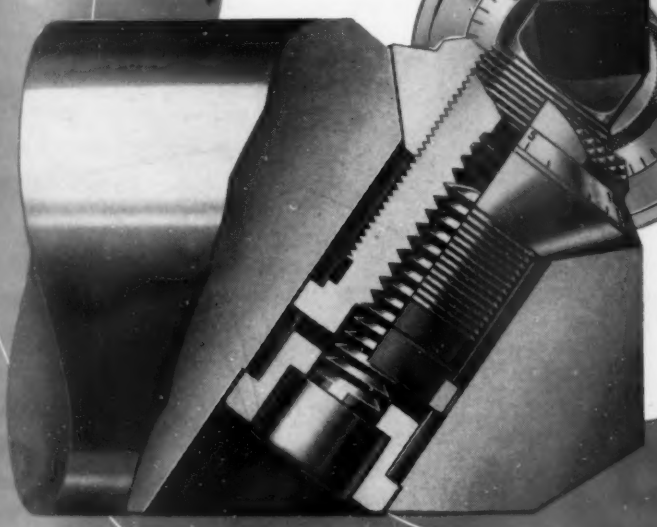

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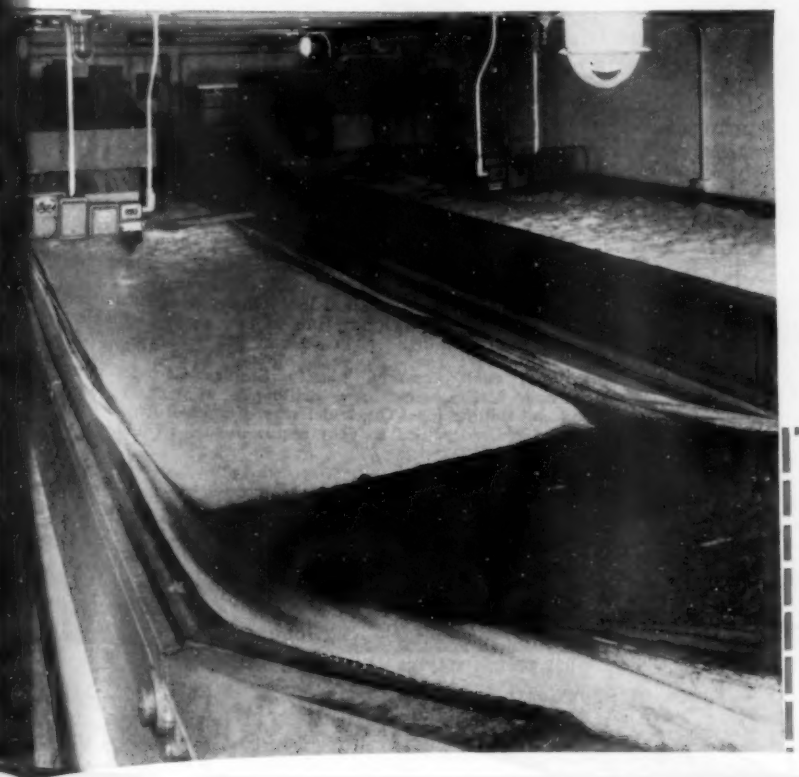

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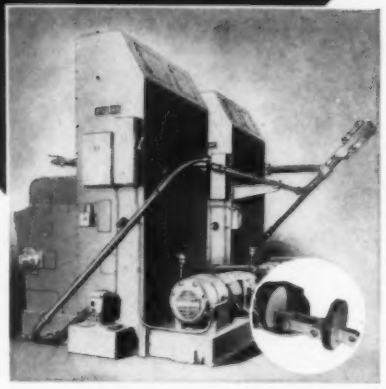
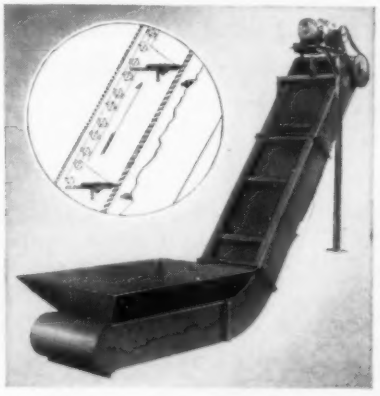


TUBULAR CONVEYOR HANDLES SMALL CHIPS

. . . from machine tools like these Oilgear Vertical Broaching Machines, using one Hapman Conveyor with *patented* Sealed-pin Chain and tough Neoprene Flights. Tubular Conveyor will also handle abrasive dusts, scale, sludges, welding flux.



Chip-O-Matic TYPE REMOVES SPIRAL TURNINGS

. . . large chips, small parts, stampings and scrap automatically. Simple and dependable in design, this money-saving conveyor can be adapted to remove parts from coolant tanks *without* loss of coolant. Also has Sealed-pin Chain and Rib Flights with Neoprene wear strips.

GET DETAILS ON BOTH COST-CUTTING TYPES — WRITE FOR:
Tubular Conveyor Bulletin TE-1153
Chip-O-Matic Bulletin C TE-1153

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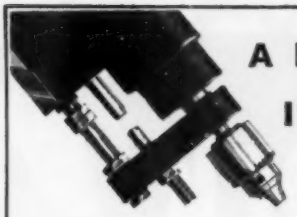

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Here's how you can triple your tool life on all types of line and piloted reaming jobs—use Staples Shell Type Expansion Reamers. To compensate for wear, reamer shell expands to original diameter by driving it up the tapered arbor. Re-expand shell until maximum carbide utility is reached. A new tool is obtained simply by replacing the worn shell—a standard item. Many design variations of this tool are possible, including use of two shells of different diameters for step reaming.

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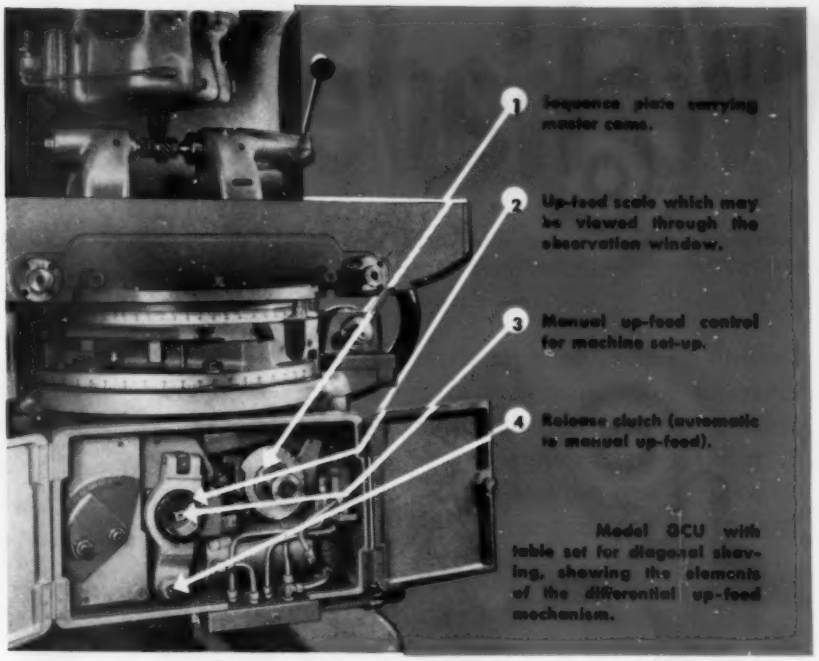
GEAR SHAVING NOW *Much Faster and More Flexible*


1 Sequence plate carrying master cams.
2 Up-feed scale which may be viewed through the observation window.
3 Manual up-feed control for machine set-up.
4 Release clutch (automatic to manual up-feed).

Model GCU with table set for diagonal shaving, showing the elements of the differential up-feed mechanism.

When Automatic Differential Up-feed and Conventional Crowning were added to the Red Ring Model GCU, shaving speed, flexibility and economy were all significantly increased.

AUTOMATIC DIFFERENTIAL UP-FEED

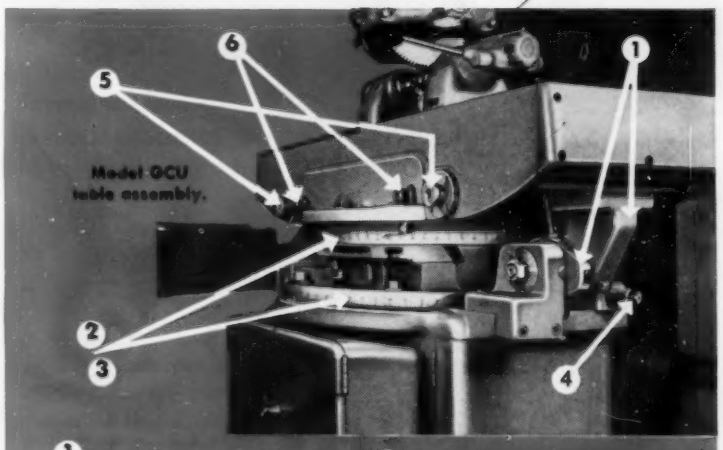
This efficient device provides for the first time an automatic cycle applicable to both diagonal and conventional shaving. This cycle is controlled by an eleven-position master cam. Included are backlash take-up, infeed cutting strokes, idling strokes and return to unloading backlash. The entire cycle or any portion of it may be used depending on job requirements.

The cam itself does not actuate knee movement. It is strictly a stepped gaging device. Consequently every knee movement is positive, extremely precise and very fast. No danger of operator's errors. Perfect accessibility for fast loading and unloading.

One of the two control cams carried by the feed unit sequence plate.

CROWNING

Gears being shaved conventionally can be crowned by rocking the table about a central pivot during the automatic cycle. The cam controlling the rocking movement is located on table centerline to avoid any tendency to twist. This device also provides for taper shaving.



1. Crowning cam and bracket.
2. Scales for diagonal shaving set-up.
3.
4. One of 2 tapered shot bolts used to realign table and ways for conventional shaving.
5. Lock pins when removed, permit table to rock for conventional crowning.
6. Bolts operated from the front of the machine actuate tapered wedges to lock table to the ways.

Write for Bulletin S53-7 for full details.

6585

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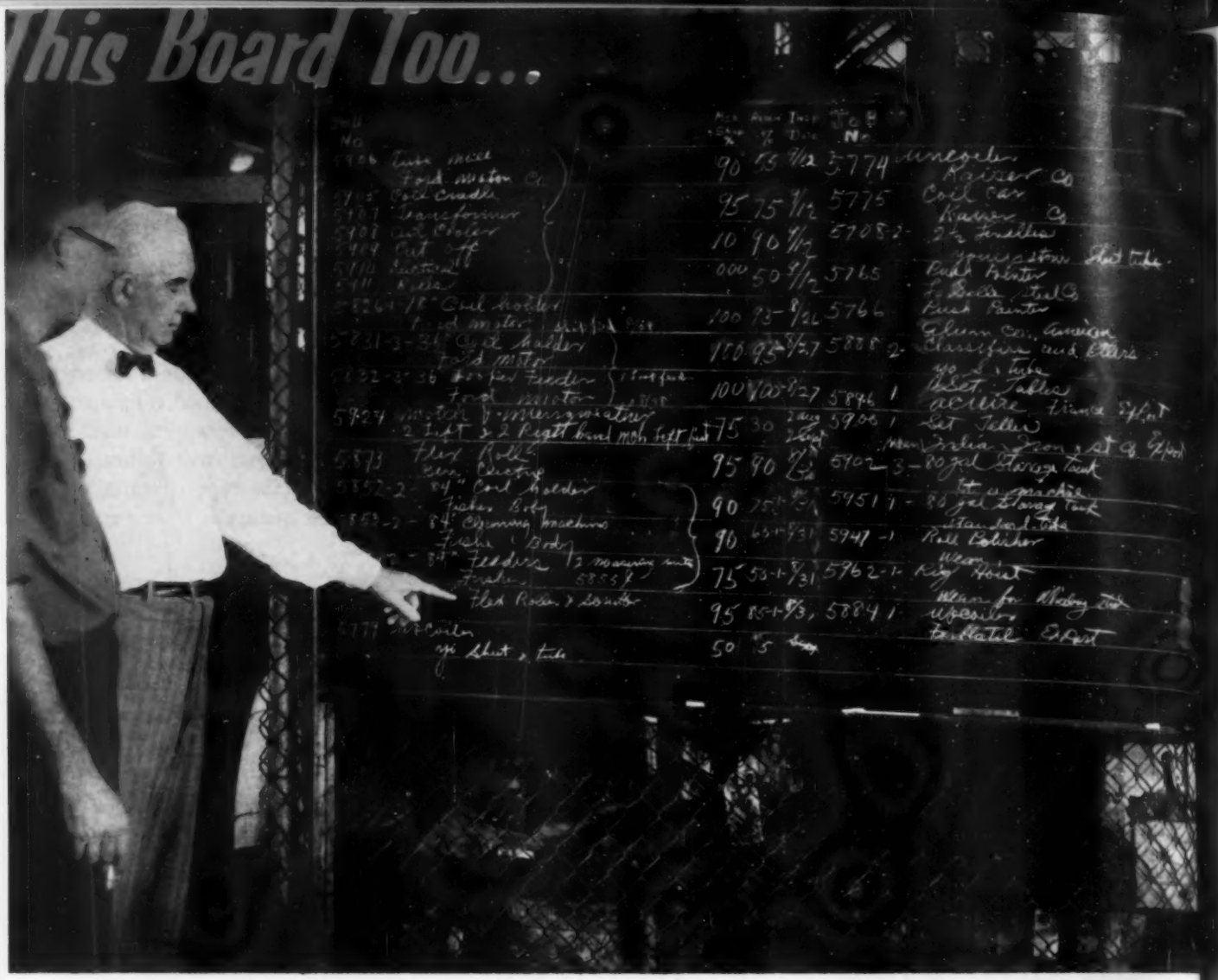

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Through the years this board has carried the names of America's best known manufacturers. They build their names on quality products at fair price and they must have sturdy, long-lasting, maintenance-free, high-production, precision equipment to achieve this end consistently. Getting just such quality equipment is the reason why their names appear on this board. For this is the Production Board at Plant 2 of the McKay Machine Company, one of the world's best known builders of standard and special metal working machinery.

For example, if you were to read the board the day the photographer took this picture you would find such familiar names as Ford Motors, Motch and Merryweather, Fisher Body, General Electric, Kaiser, Youngstown Sheet and Tube, Aluminum Company of America, Wean Engineering, Wheeling Steel, Standard Tube, and LaSalle Steel. At any other time, just as impressive a list of leading manufacturers could be found on this board.

So, if you use special or standard metal working equipment such as forming machines, draw benches, tube mills, levelers, upcoilers, strip processors, press feed lines, shear lines, coil handling equipment, join America's best known manufacturers on this McKay Production Board.

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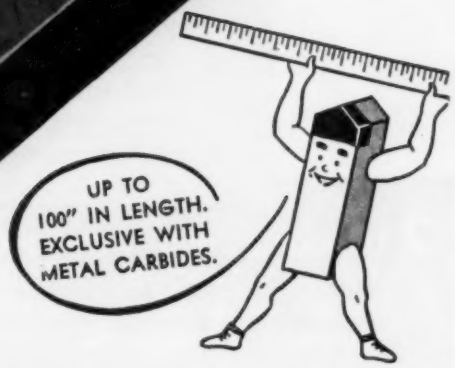

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Just as you purchase **steel bars, strips or rods** in standardized sizes or cut lengths, you can purchase **Talide Bar Stock.** You can buy this super hard metal cut to any length and finish grind in your own shop or purchase the required finished sizes direct from us. Cut lengths are available from stock at these warehouses:

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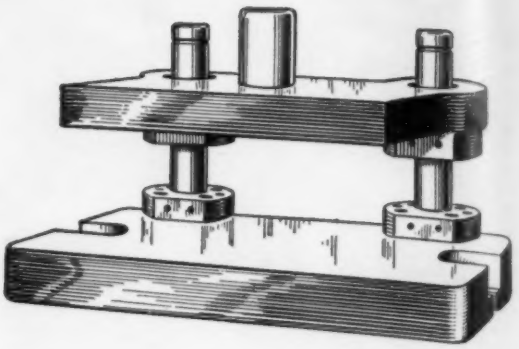

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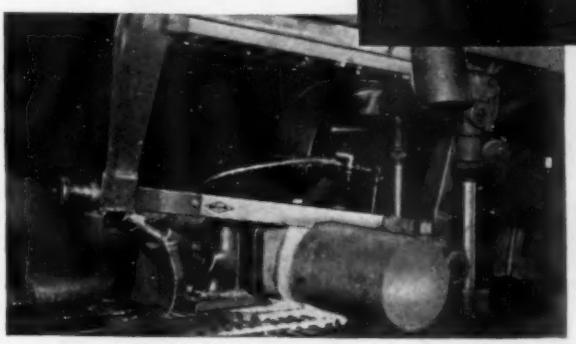

Every Barnes Power Hack Saw blade is individually Rockwell tested to assure you the fine quality for which Barnes blades are famous.

Your Industrial Distributor will help you select the best blade for your job.

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TRANSMISSION CASE (CAST IRON) THREE TYPE I, ONE TYPE III SURFACES

PUMP GEARS (CAST IRON; STEEL) SIDE SURFACES, TYPE IV

TRANSMISSION COVER AND GOVERNOR BODY (BOTH ALUMINUM) TYPE III SURFACES

PINION GEARS (HARDENED STEEL) THREE TYPE II, TWO TYPE IV SURFACES

FOR PRECISION FINISHING OF FUNCTIONAL SURFACES

PowerFlite transmission parts are *Microhoned*

Chrysler engineers, with years of proficiency in production-processing of precision parts, have specified the Microhoning process as the method for obtaining

✶ DIMENSIONAL ACCURACY ✶ GEOMETRIC PRECISION ✶ CONTROLLED SURFACE FINISH

required for the efficient functioning of the new PowerFlite transmission.

FOUR TYPES OF SURFACES IN THE *PowerFlite* ARE MICROHONED:

Type I—Cylindrical surfaces through which a piston or valve moves.

These surfaces must be round, straight and accurately sized, with a controlled surface finish—in order to minimize wear and eliminate oil leakage. The Microhoned finish assures non-flaking surfaces between the stationary and moving parts.

Type II—Cylindrical surfaces in rotating parts.

Microhoning maintains concentricity of pitch diameter of teeth and the bore of gears, permitting teeth to mesh with minimum noise and wear. The bore must have precise geometry, size, and functional finish to retain a lubricating film at high speed.

Type III—Flat surfaces that are bolted together without a gasket.

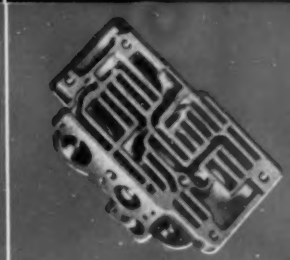
They must be flat enough so that they will not distort when pulled together, and must have a surface finish that will mate to form a tight, effective seal.

Type IV—Flat surfaces that move in contact with stationary surfaces.

These must be smooth and flat in order to minimize friction and wear, and maintain a "running seal", thus eliminating leakage.

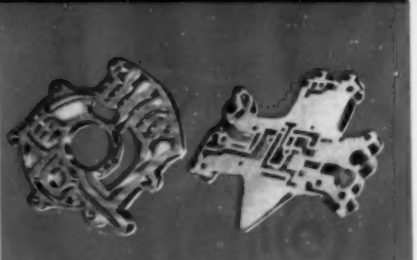
For more information on the Microhoning process write to:
Field Engineering B7
Micromatic Hone Corporation
8100 Schoolcraft Avenue
Detroit 38, Michigan

VALVE BODY (ALUMINUM) TWO TYPE II, ONE TYPE I SURFACES



KICK-DOWN GEARS (STEEL) TYPE IV SURFACES

TRANSFER PLATE AND REGULATOR BODY (BOTH STEEL) TYPE III SURFACES



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REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

Whether your dies are simple . . .

you can speed production, save time and money,

1 Simple pierce and cutoff die, designed for Electric Auto-Lite Co., Toledo, operates at speeds faster than 400 strokes per minute. Die has produced over 2,000,000 strokes . . . and still does not require resharpening.

Actual performance records prove carbide dies effective over wide range of uses

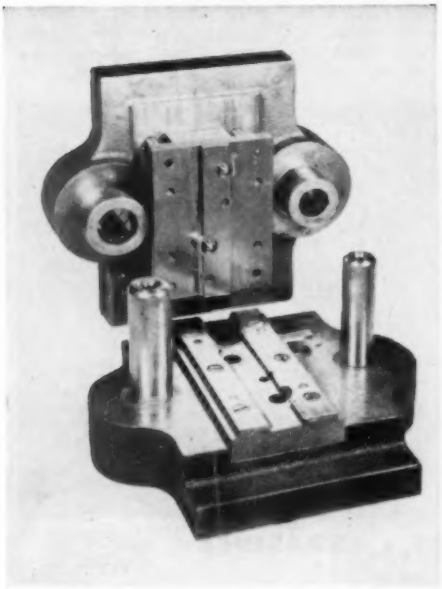
ACTUAL plant performance has proved how easy and profitable it is to use Carboloy cemented carbide over a wide range of applications. For blanking, forming, drawing and piercing . . . for large or small, simple or complex dies . . . only carbides will give you benefits like these:

- **Production runs 35 times greater than steel (see picture No. 7)**
- **Over two million high-speed strokes . . . without needing resharpening (see picture No. 1)**
- **Accurate tolerances held for months . . . compared to days with steel (see picture No. 6)**

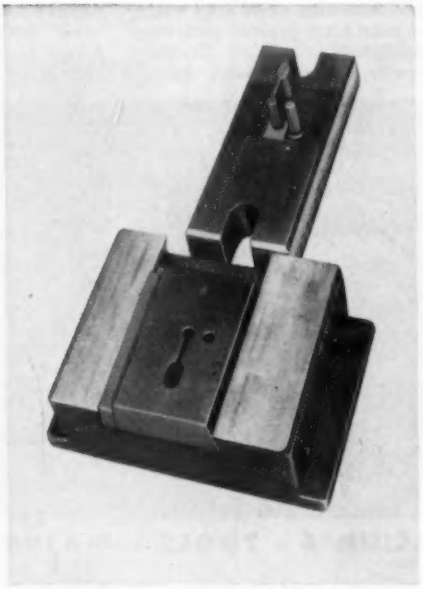
Read the case histories on these pages. They are but a few from the wide range of carbide press-die applications. Then explore the possibilities of carbide in your press dies. Carboloy personnel and services will give you or your die maker every possible assistance.

If you wish, a Carboloy Sales Engineer will call at your plant, without obligation. He'll show you how simple it is to apply and maintain carbide dies; how to get increased production with fewer rejects. Or, you can send your key personnel to the Carboloy Training School in Detroit.

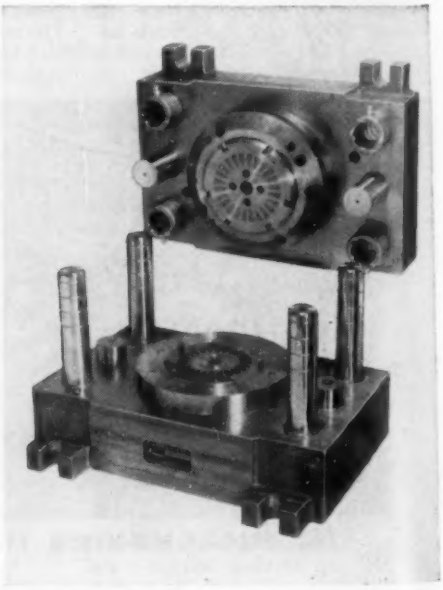
Also, you can get free Carboloy Die Engineering Manual D-124. It shows you how easy it is to design, apply and maintain carbide dies. Get all these free, profit-building Carboloy services by mailing the coupon at right.



2 Simple progressive washer die, used at Precision Spring Company, Detroit, Michigan, pierces and blanks spring-tempered steel washers. This die delivers several million hits per sharpening.



3 Notching die, wearproofed with Carboloy cemented carbide, stands up under severe day-after-day pounding. Because carbide wears 10 to 50 times longer than steel, maintenance costs are lower.

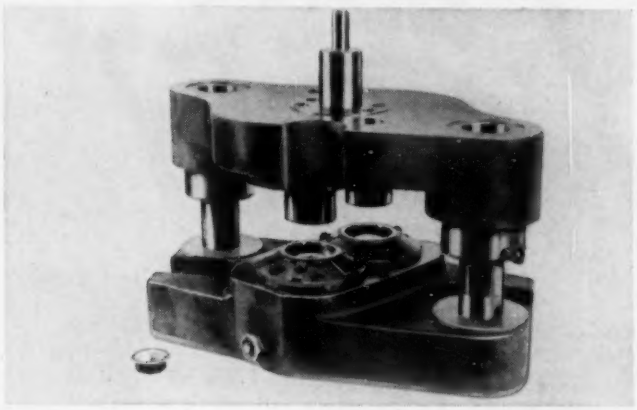


4 Piercing die, made for E.M.F. Dordt, Holland, was designed to pierce a small stator in 24 places. When dies have been wearproofed with cemented carbide, production increases, downtime decreases.

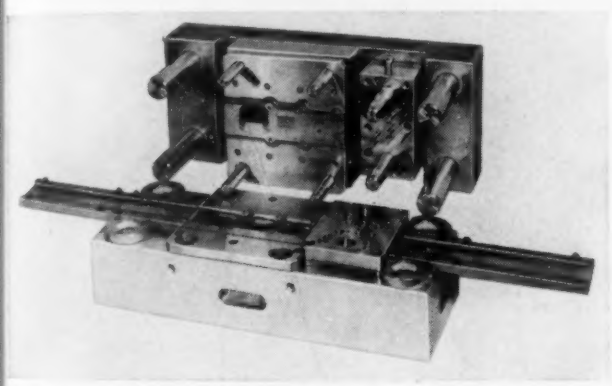
...or whether they are complex

...by equipping them with CARBOLOY®
CEMENTED CARBIDE

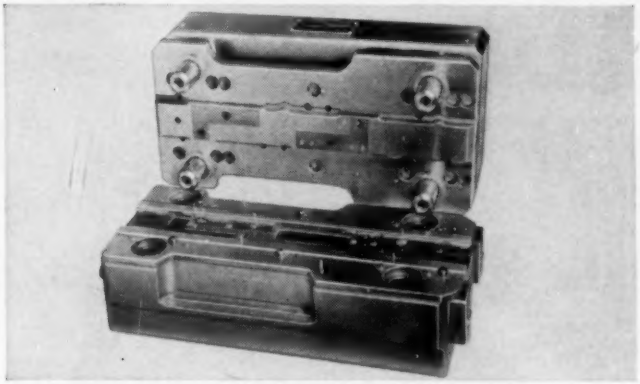
5 Single notching dies, also made for E.M.F. Dordt, Holland. Special design permits details to be interchanged on the same shoes to take full advantage of the carbide in short-run production.



6 Blanking and drawing of screw bottle caps is done by this die for Armstrong Cork Company, Lancaster, Pa. Die operated accurately on material .006" thick for months. Steel die had to be changed each week.



7 Lamination die made for Schick, Inc., produces rotor and stator laminations of motor-grade silicon steel. Customer reports carbide die produces average runs 35 times as long as steel dies.



8 Lamination die punches two, high-silicon "L" laminations per stroke. Dies of this type are in use throughout the metal-working industry, outwearing and outproducing steel dies time and again.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

"Carboloy" is the trademark for the products of the Carboloy Department of General Electric Company

FILL OUT THE COUPON . . . MAIL IT TODAY!

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DEPARTMENT OF GENERAL ELECTRIC COMPANY

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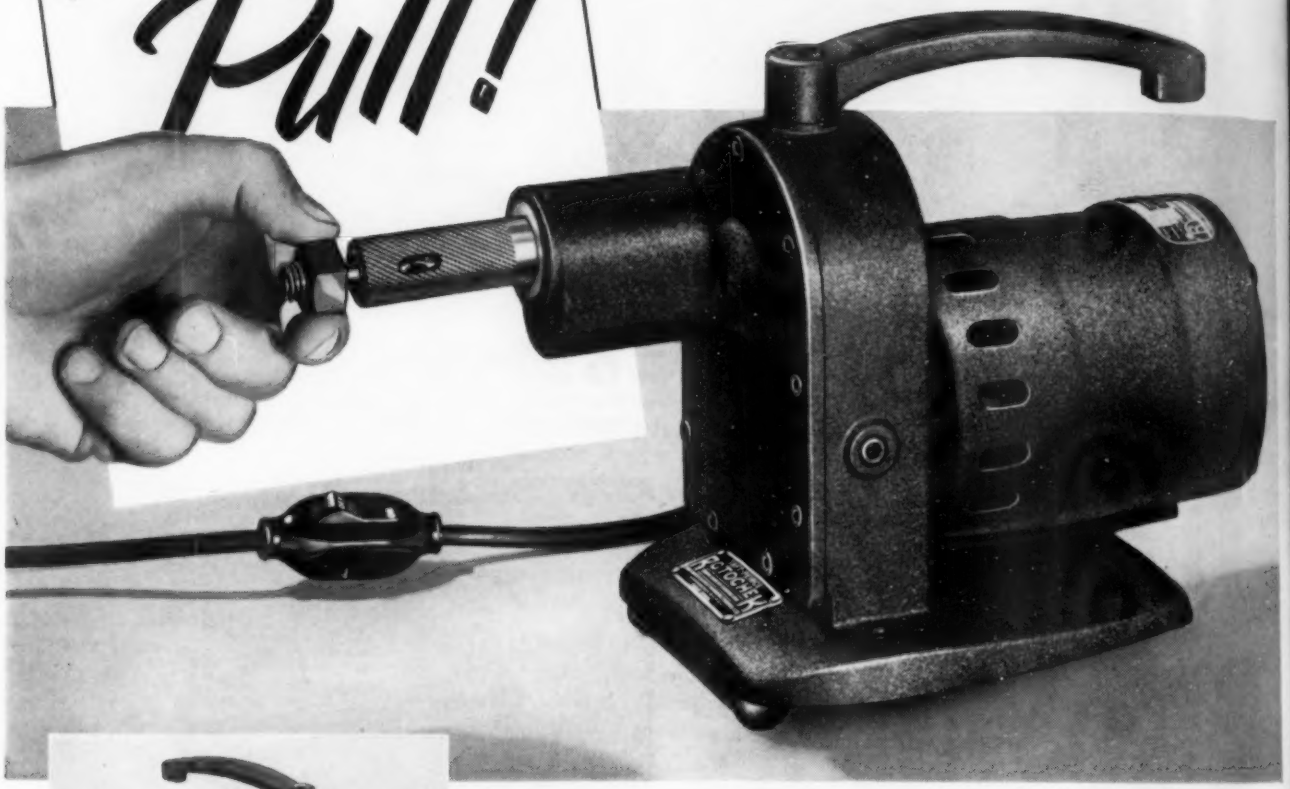
- ☐ Rush me free Carboloy Die Engineering Manual D-124
- ☐ Send complete details on free Carboloy Training School
- ☐ Have a Carboloy Field Engineer call at my plant

Name_____ Position_____
Company_____
Address_____
City_____ Zone____ State_____

Push! Pull! ...and the thread is inspected



Taft-Peirce Rotochek* Gages 3 times faster

Here's the fastest thread gaging method yet devised. Bring the Rotochek to the part, or the part to the Rotochek — a slight push and the gage screws into the work. Release the pressure and the gage stops. Pull — and it disengages.

It's fast . . . accurate . . . easy to use. Operators report from 3 to 4 times as many parts inspected daily.

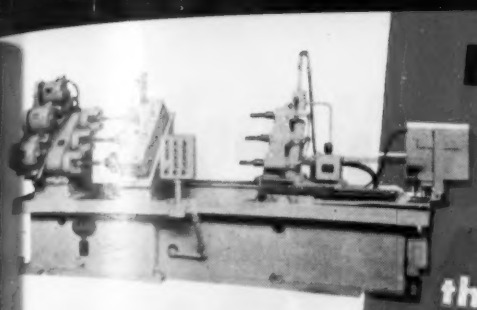
Available in bench model, or with handle and flexible shaft. Adaptors permit use of reversible thread members and ring gages.

It will pay you to write for full facts today.

*Registered U. S. Patent Office

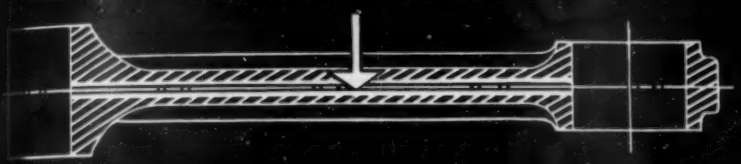
THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.

T-P means Top Precision



NATCO Deep Hole Driller
DRILLING 5/16" HOLES UP TO 14½" DEEP
through 3 connecting rods at one time!

5/16" oil holes drilled through connecting rods from 12¼" to 14½" deep.



THIS NATCO FEATURES—

FLEXIBILITY—Performs operations on 3 of any one of seven different sizes of diesel engine connecting rods.

TYPE OF TOOL—Oil tube type gun drill held stationary.

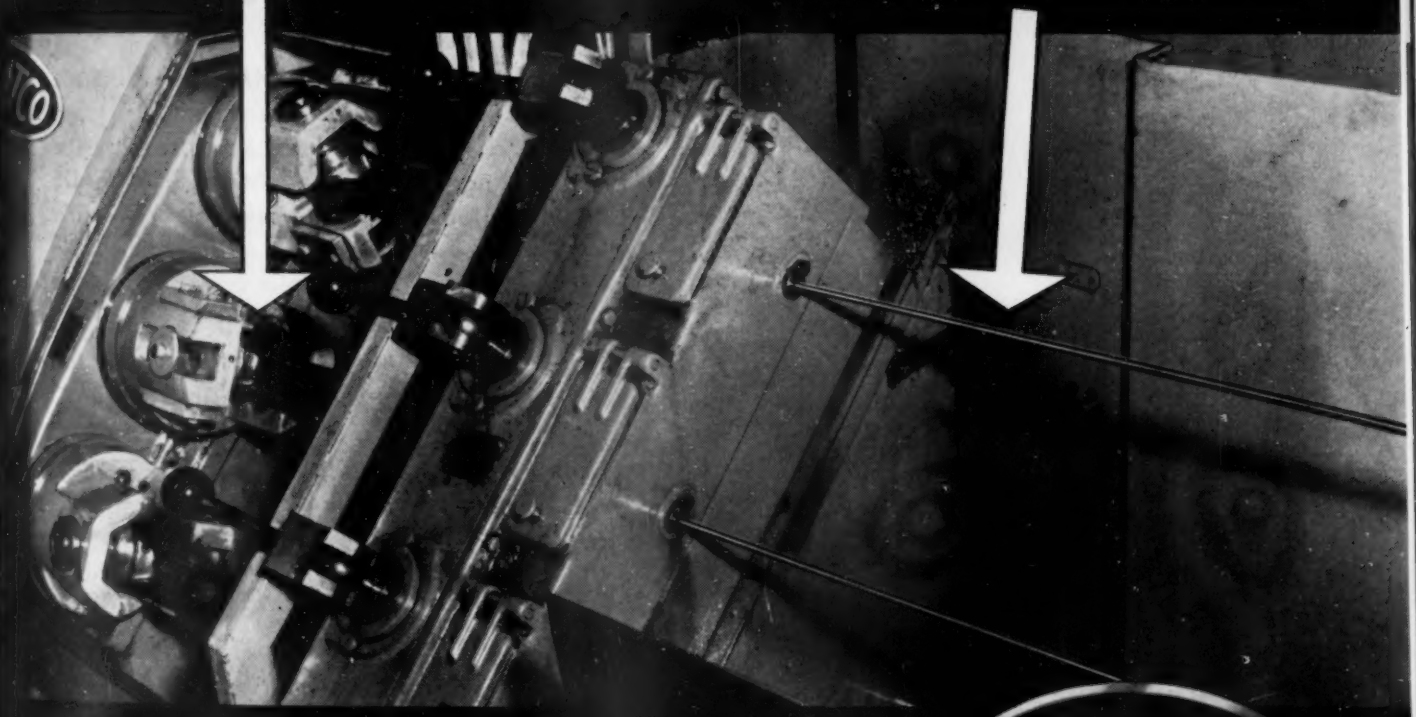
FIXTURE—Three rotating type holding units.

DEPTH OF HOLES—Holes vary from 12¼" to 14½" depth.

COOLANT—High pressure coolant through drills to remove chips.

SAFETY—Torque overload is provided for tool protection.

PRODUCTION—Approximately 8 parts per hour.



Call a Natco Field Engineer
to help you solve your problems in
Drilling, Boring, Facing and Tapping.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

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BUFFALO, 1807 Elmwood Ave. • NEW YORK, 35 Beechwood Av.. Mount Vernon

WAUKESHA SHORT SHANK INSERTED BLADE SPADE DRILL especially developed for large hole drilling with screw machines.
The WAUKESHA STUB HEAD SPADE DRILL may be used with holders made by yourself from tube stock to any length for extremely deep hole drilling. Thus you avoid paying a premium for a "special" tool.
Inserted Blade Reamers, Spade Drills, Floating Chucks and Tool Holders, Counterbores and many special tools are shown in WAUKESHA Catalogue. Complete with sizes and prices. Send for your copy today.
IT PAYS TO CHECK WITH WAUKESHA

YOU CAN SAVE

costly boring in large hole drilling from the solid with

WAUKESHA INSERTED BLADE SPADE DRILLS

Low in first cost, WAUKESHA Inserted Blade SPADE DRILLS solve the problem of taper wear on a solid drill. Since you use only the blade cutting edge of the WAUKESHA SPADE DRILL the blade maintains original O.D. grind after grind — through the entire life of the blade . . . And blade replacement costs little — the body lasts for years.

And you can save costly boring. Here's an example: A job called for drilling out a 3⅛" hole through 120 pieces of steel 10" long. Previously they used a 2" solid twist drill and then bored to size . . . BUT with a WAUKESHA 3⅛" SPADE DRILL they not only completed each piece in one operation but also ran a carbide turning tool simultaneously on the periphery.

SAVINGS: The Spade Drill and 3 blades paid for — PLUS $260.00 on the first run of 120 pieces.

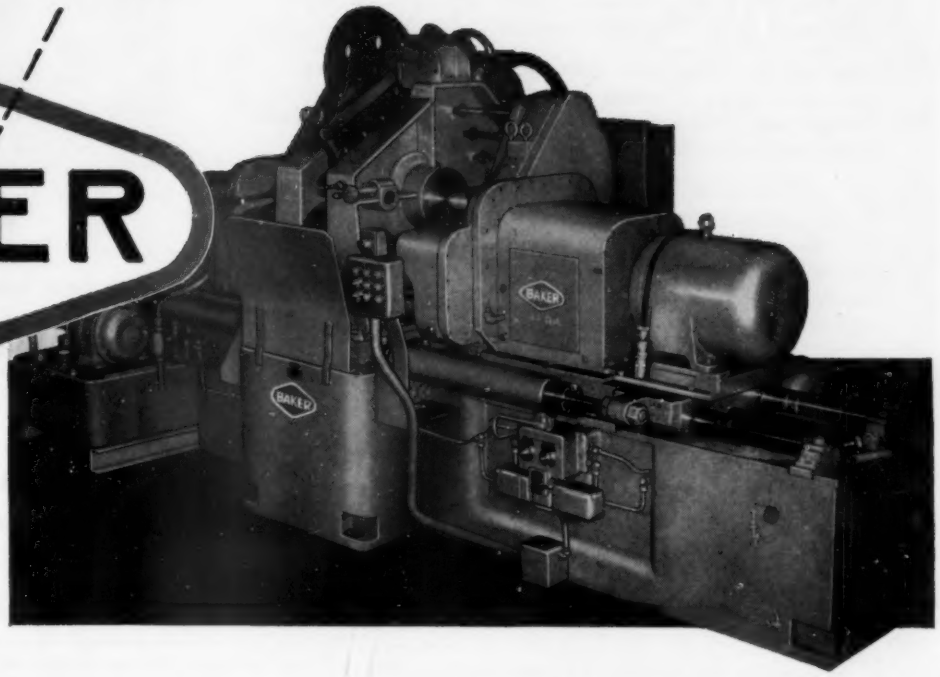
WAUKESHA TOOL CO.

WAUKESHA, WISCONSIN

Modern Machine Tools..

SLASH PRODUCTION COSTS!

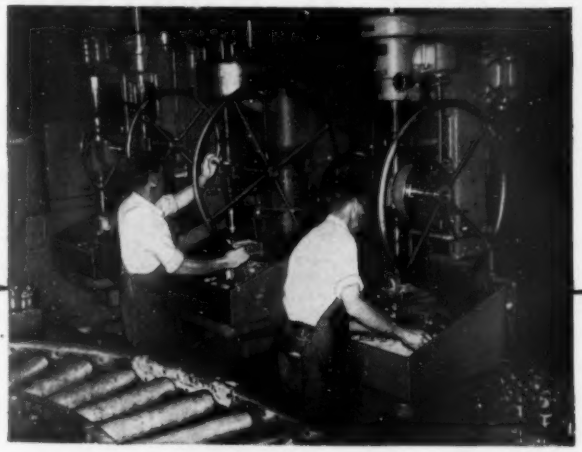
New BAKER Method



1 Operator . . .
1 Machine . . .

Multi-Operations Fully Automatic On 4 Parts Simultaneously—Load—Drill—Core Drill—Ream—Unload

THE OLD METHOD —



2 OPERATORS . . 4 MACHINES . .

Hand Controls + Excessive Handling + Capstan And Hand Engagement Of Feed + Operator Fatigue = Low Production Rate At High Cost.

INCREASE PRODUCTIVITY .. with a NEW BAKER 'Special'

WRITE REGARDING YOUR SPECIFIC JOB PROBLEMS...

BAKER BROTHERS, INC. Toledo, Ohio
DRILLING...TAPPING...KEYSEATING and CONTOUR GRINDING MACHINES

NEW UNIVERSAL
RADIAL HOLE-DRILLING MACHINE

A Standard Machine
Designed for Variety Production

Why build a special machine for drilling radial holes when a standard machine equipped with Govro-Nelson Automatic Drilling Units will, in many cases, perform the work of a special machine that would cost considerably more!

Any number of drilling units up to eight may be employed. the units being movable not only through 360 degrees on the circular table but also movable endwise on riser plates to meet the requirements of the part being drilled.

The machine may also be used for tapping operations with Govro-Nelson Tapping Units. It has a range of 1/32″ to 3/8″ on drilling operations and 0-80 to 3/8-16 on tapping operations, depending on material and spindle speeds. A single, momentary contact start-button causes all units to operate simultaneously.

If you are interested in reducing the cost of your radial drilling and tapping operations, write for price and dimensional data.

WRITE FOR *Literature*

Automatic DRILLING UNIT

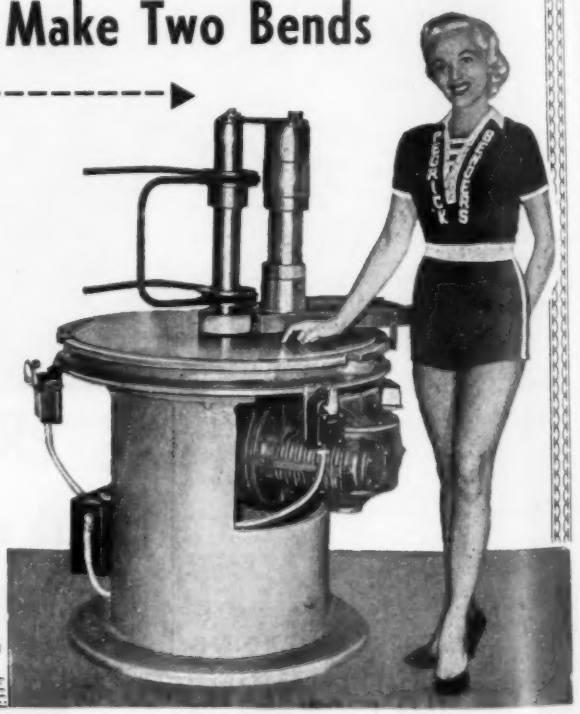
GOVRO-NELSON CO.
Machinists of Precision Parts for 30 Years
1933 ANTOINETTE DETROIT 8, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-280-1

IT TAKES TWO TO MAKE A BARGAIN
But Only ONE MACHINE To Make Two Bends

Now you can make two bends at the same time in a piece already bent on different planes. The dies are adjustable to any centers within the height of the central die spindle. This feature also insures that both the top and bottom bends will be identical. The PEDRICK Benders are equipped with automatic relay controls for automatic duplicate production bending. Ideal for chair frames, cart handles, and a myriad of other applications.

Write for descriptive folder.
Prices as low as $1575.00



PEDRICK TOOL & MACHINE CO.
3640 North Lawrence St. Dept. 12 Philadelphia 40, Pa.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-280-2

PARKER • MAJESTIC PM PRECISION MACHINES

Pictured here is the home and products of

PARKER-MAJESTIC, INC.

For almost a quarter of a century this company has manufactured the **Parker** Spindles used in Precision Grinding, Boring and Milling applications. Additional products include the well known line of **Parker-Majestic** Internal, External, No. 2 Surface and Rotary Surface Grinders.

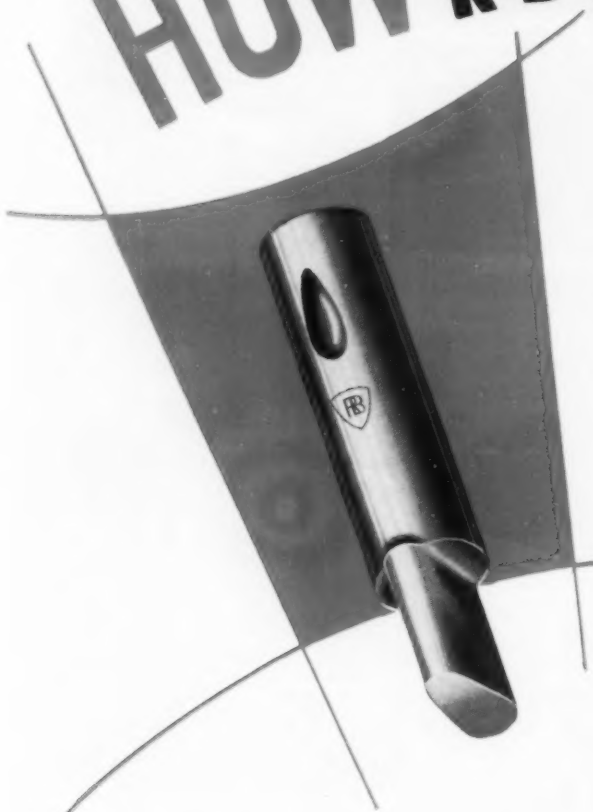
Descriptive literature upon request.

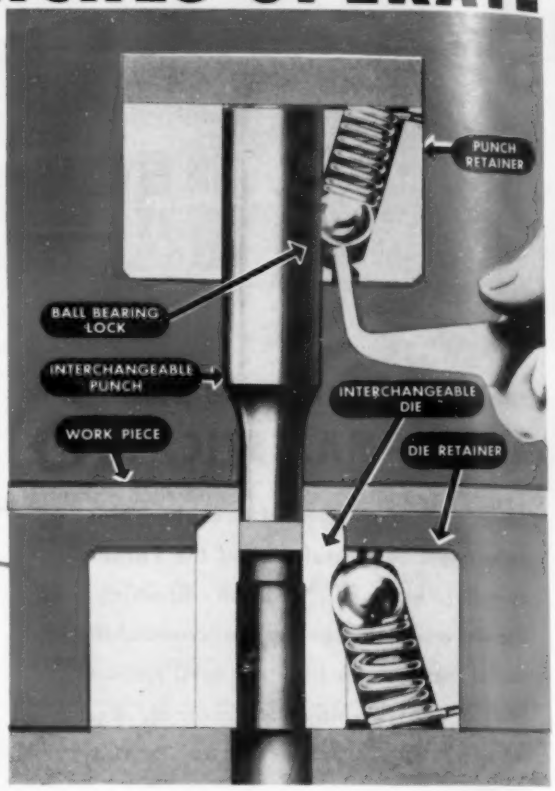
PARKER-MAJESTIC, INC.

formerly MAJESTIC TOOL & MFG. CO.

147 JOS. CAMPAU • DETROIT 7, MICHIGAN

HOW R-B PUNCHES OPERATE





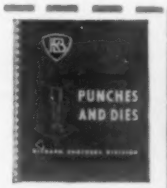
R-B standardized punches and die buttons are inserted in their retainers with a simple push and a twist.

Punches and die buttons are instantly removed by inserting a tanged tool in retainer hole to release the locking ball.

Each R-B retainer is equipped with a spring-loaded locking ball which engages the recessed portion of standard and special R-B punches and die buttons. Locked punches and die buttons are always accurately aligned—no additional keying is required.

Use R-B Engineering Service for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
Dept. 76, 12667 **BURT RD.** • **DETROIT 23, MICHIGAN**



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COMPANY_____

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Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
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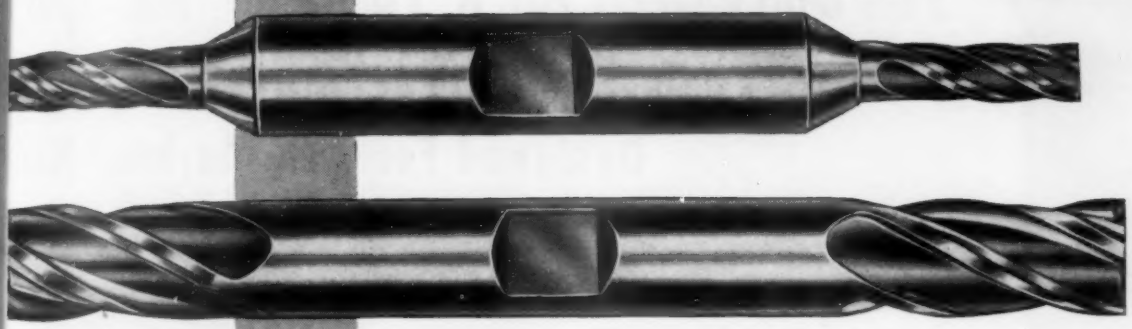
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

Another Quality Engineered

ATRAX TOOL



Double-End Carbide End Mills
Precision Machine Ground-from-the-Solid

1. Shanks flatted for set screw.
2. Cutter 1/8" to 9/32" diameter of brazed inserted type construction—prevents loosening or separating from steel body, a hazard of conventional built brazed construction.
3. Cutter 5/16" to 1/2" diameter of solid carbide throughout —adding rigidity and strength for extra heavy cuts.
4. Backed by the Atrax quality reputation— the finest carbide tools of this type.
5. Available in 2 and 4 Spiral Flutes.

Representatives and Distributors in principal cities in United States and Canada. Write for name of representative in your area.

Send for complete catalog NOW!

THE ATRAX COMPANY

NEWINGTON 11, CONNECTICUT

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MACHINE STAMPING AND EMBOSSING DIES

Higher production with CADILLAC Dies is assured by special steel selection, controlled heat treatment and precision engraving — noted for accuracy and high quality. We'll be glad to advise you on best marking methods.

PUNCH PRESS DIE

ROLL SEGMENT DIE

SOLID ROLL DIE

HEAVY BEVEL STEEL LETTERS AND FIGURES

The faces of CADILLAC Steel Letters and Figures combine a high degree of hardness with toughness, insuring exceptionally long life. Each stamp is clearly marked with character designation and size. Long tapering bevels assure easy alignment of characters. *(To the right, note CADILLAC's sturdily boxed Interchangeable Steel Type Set.)*

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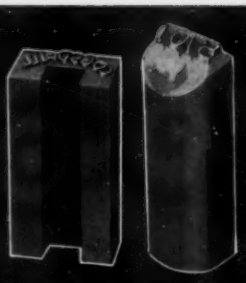


DIE INSERTS

EMBOSSING DIE

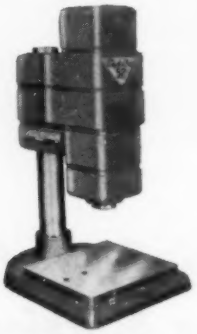
You Don't Need An X To Mark "The Spot"

There Are CADILLAC MARKING DEVICES Designed For ALL Marking Needs

Just as "variety" is called "the spice of life", varieties of marking methods and devices are essential for meeting modern production demands. CADILLAC STAMP COMPANY is equipped to offer or build every conceivable type of marking device, from simple hand stamps to especially created and designed machinery for unusual marking requirements.

CADILLAC 115 HAND MARKING MACHINE

For general purposes this floor type machine gives top service. Marking is done in a rolling operation—requiring minimum pressure. Marks flat or round parts of varying thickness. Foot pedal for marking flat or irregular contoured parts; table screw adjustable for round parts.



CADILLAC 52 AIR IMPACT PRESS

For high speed marking, assembling, branding, staking, crimping, riveting, also for producing light stampings. The 52 effects great savings in production — delivers speeds up to 10,000 strokes per hour—pressure up to 8 tons. Safe to operate, automatic controls. Can be hand, foot or electrically actuated.

Machines Above, Write for Bulletin M-120
Misc. Items, Write for Bulletin SE-130.

CADILLAC 45 HYDRAULIC MARKING MACHINE

Here's a compact, self-contained, ma... fold mounted, hydraulic unit. One ... trol gives full range of marking de... It will mark round, flat and irregu... surfaces. Machine capacity is up to ... one inch impressions per minute.

HAND STAMP NUMERALS

INTERCHANGEABLE TYPE AND TYPE HOLDER SET

HAND STAMP SYMBOLS

CADILLAC
Marking Devices

CADILLAC STAMP COMPANY

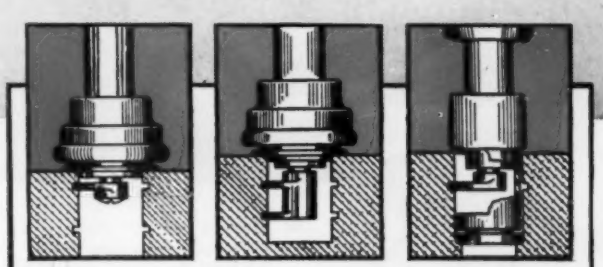
Factory and Offices

17313 Ryan Road • FO. 6-0500 • Detroit 12, Mich.

Waldes Truarc Internal Grooving Tool

for precision cutting of internal grooves in bores and housings

FAST! ECONOMICAL! NEEDS NO SKILLED LABOR!



Groove located from top of hole | Double groove located from top of hole | Groove located from bottom of hole

Internal groove-cutting becomes the simplest of operations with Waldes Truarc Internal Grooving Tool. Easy to adjust—easy to operate...readily adaptable to individual requirements.

Designed for use in any hand drill or automatic drill press and screw machine... assures a concentric recess without injury to metal. Operates by fingertip pressure—especially suitable for unskilled operators.

The Waldes Truarc Grooving Tool when used in an electric or pneumatic hand drill, can be taken to the job eliminating disassembly and excessive handling...resulting in all-around savings in time and costs!

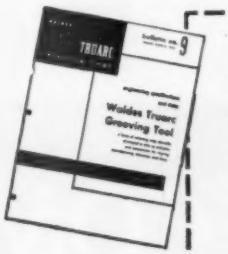
Write now for new 12-page Catalog giving mechanical details, cutting sizes...extra features...full information

WALDES

TRUARC

REG. U.S PAT. OFF.

GROOVING TOOL



WALDES KOHINOOR, INC., 47-16 Austel Place, Long Island City 1, N.Y.
Waldes Truarc Grooving Tool
Manufactured under U. S. Pat. 2,411,426

Waldes Kohinoor, Inc., 47-16 Austel Place
Long Island City 1, New York TE 115

Please send me your new 12-page Catalog on Waldes Truarc Internal Grooving Tool.

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Company_____

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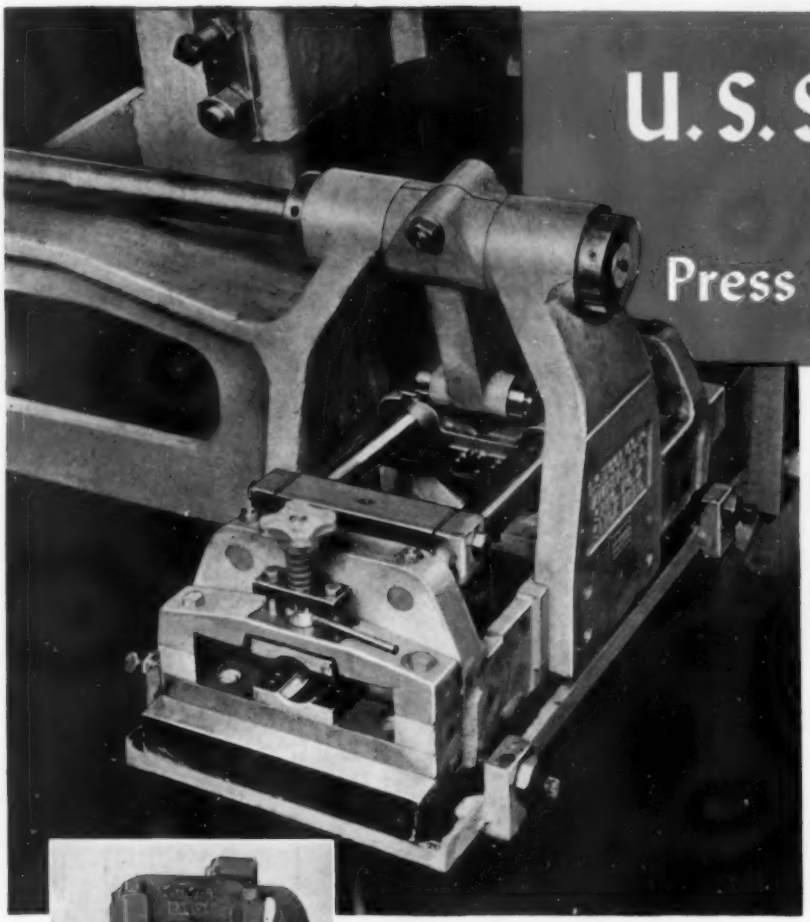
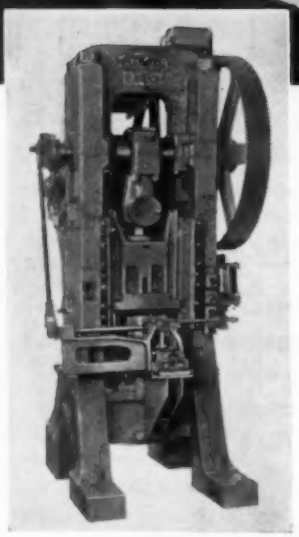


U.S. Slide Feeds Solve Your Press Room Problems

For Example . . . The Cleveland Punch and Shear Works Co., Cleveland, Ohio, received an order from The Metal Specialty Company, Cincinnati, Ohio, to furnish a number of their presses equipped with automatic feeds to feed 1⅜" diameter bar stock into the press for a cut-off operation. Because of the nature of the job and the accuracy required, it was decided to use U. S. Slide Feeds.

Accuracy . . . With the set-up above described, the accuracy of feed length must be such that the weight of the cut-off pieces be within closely controlled limits. The U. S. Slide Feed advances the 1⅜" diameter bar stock into the die ¾" at each stroke of the press, and the weight of the cut-off pieces varies less than 1 gram. With the U. S. Slide Feed the travel of the feed block is constrained between positive stops, thus assuring controlled accuracy.



The close-up above shows U.S. Slide Feed, arranged to accommodate 1⅜" diameter bar stock, mounted on press manufactured by the Cleveland Punch and Shear Works Co. The illustration at the left shows the complete press with U.S. Slide feed and driving connections as installed in the plant of The Metal Specialty Co., Cincinnati, Ohio.

Versatility . . . U. S. Slide Feeds are known for their accuracy in the feeding of flat stock from coils, but as described above, they can be used with equally satisfactory results for feeding round wire, bars, and stock of irregular cross section. Also, in addition to metals, U. S. Slide Feeds can be used for the feeding of materials such as paper, plastics, mica, etc.

If you have a press feed problem, ask for a copy of Bulletin 80T on U. S. Automatic Press Room Equipment, which contains illustrations and descriptions of U. S. Slide Feeds, Straighteners, Stock Reels, Coil Cradles, Stock Oilers, Scrap Shoppers, etc.

US PRODUCTS

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

"Packaged Precision"

Measures high-precision holes to fractions of .0001"

Ready to go to work –

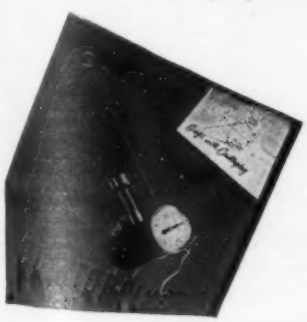
anywhere—at machine, inspection bench, selective assembly, Comtorplug can be wherever needed —instantly.

any time—hand Comtorplug to the operator and you're in business! No need for preplanning, installation of wires or hose; no headaches of electronic gadgets.

by anybody—in a few minutes any worker gets the knack of Comtorplug—its automatic features assure accuracy, and uniformity regardless of human variations—no training course or experience needed to use Comtorplug precisely.

Prominent in the Jet Engine Program

Any new, fast-moving program appreciates Comtorplug because it's so adaptable, accurate, rugged. Ideal for Statistical Quality Control. Send for details of this unique patented gage.



REQUEST BULLETIN 46

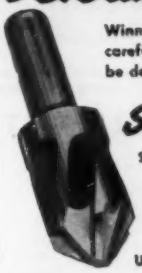
COMTOR CO.

69 FARWELL STREET

WALTHAM 54, MASS.

USE READER SERVICE CARD; INDICATE A-11-287-1

Severance CHATTERLESS TOOLS HIGH SPEED CARBIDE



Winning their way on job after job, they are carefully designed to preclude chatter and can be depended on to produce superior finishes.

• • • • •

Severance CHATTERLESS COUNTERSINKS

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November, 1953 Issue

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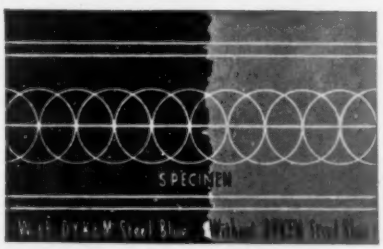

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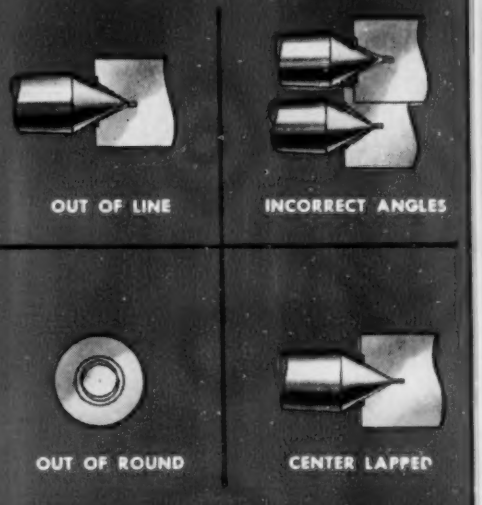

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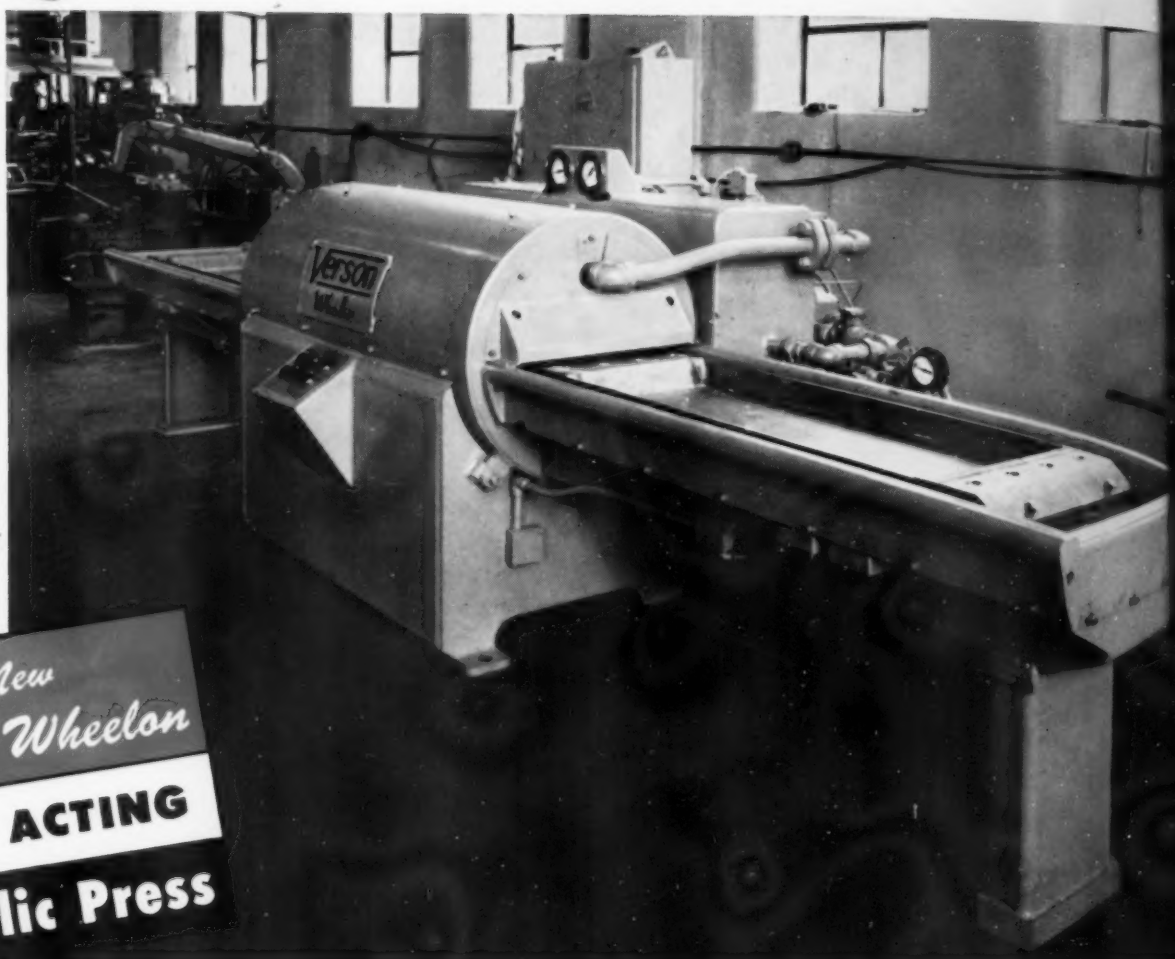

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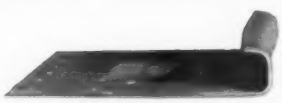

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Formed in a conventional rubber pad press

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